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This Week in The IRON AGE

Vol. 156, No. 12 September 20, 1945

Editorial

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Technical Articles

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Features

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News and Markets

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Steel Without Priority

IMMEDIATE SHIPMENT FROM RYERSON STOCKS

This may not be news to you—but government restrictions have been lifted on the sale of steel products by warehouses. You can now obtain steel from stock in every form without red tape—only rated priority orders take precedence. This is a welcome relief for all of us. A small part of the victory you and we have worked so hard to win.

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The IRON AGE

ESTABLISHED 1855

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September 20, 1945

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The Rabbits Multiply

ONE of the ancient Ford stories was about a sparrow that, full of hope, followed a Model T for miles and then gave up in disgust, saying: "You can't live on promises." Apparently our little feathered friends learn by experience which is more than can be said for the average American. At least that seems to be the appraisal of our acumen by the politicians.

Some 16 years ago Americans were promised two chickens in every pot and two cars in every garage. Nothing was said about furnishing either the pots or the double garages to those who did not have them, so this might be called a limited promise. Today the promises are much broader. You can't halt progress, even in promises.

So today we have the eminent farmer, Mr. Wallace, now Secretary of Commerce, urging the government to promise 60 million jobs, needed or not. And the eminent patent attorney, former Labor Board head and now chief engineer of our economic gyroscope, holding out the promise of 40 to 50 pct more pay for everybody, regardless of the price structure. Mr. Kilgore, criminal court judge and now Senator from West Virginia, proposes to pay people not working up to $25 per week, which is pretty good considering that wages of all of our people who were working in 1939 averaged $16.80 per week. And that the 7.8 million workers in our industrial occupations averaged $20.

Heavenly days are here again. How the rabbits multiply!

Now I have no objection to rabbits in their place, which is in the making of rabbit stew or felt hats. What I don't like is to have the process reversed by politicians and rabbits taken out of hats instead of put in them.

If they pulled out some practical, concrete plans for obtaining what they promise, that would be something else again and we would all welcome it. Nobody would object to a raise of 50 pct in his wages. And I am sure that employers who make and sell things and whose markets depend on purchasing power would be glad to see everybody make $100 per week or more in real wages, provided business did not go broke in the process and thus leave nothing available for $100 per week to buy.

The unfortunate and extremely dangerous natural inference from Mr. Davis' statement that wages can be raised 40 to 50 pct without disturbing the present price level is that employers are making unholy profits whereas their net after taxes is less than the percentage earned in prewar years. Nothing was said about government's obligation to loosen the choke collar of taxes, nor of labor's responsibility to increase output per manhour in like proportion.

The false whiskers on Mr. Davis' rabbit are revealed in his statement that wages are not the major part of costs. That may be true in a few specialized industries whose product consists of expensive purchased materials or parts. But when you trace these back to the ground from which they come, you find that labor cost becomes the larger part of total cost. Wages, according to government statistics, constitute more than 85 pct of our total national income, and therefore of the cost of all goods and services. How can you add 40 to 50 pct to this national wage bill without raising prices and without getting everybody to do 40 to 50 pct more work is a $64 question that no rabbit can answer even if he knows how to multiply.

Finer Things Are Coming Out of the Ground

From the ore ranges, the coal fields, and the limestone beds are coming vast quantities of blended iron ore, coking coal, and purest limestone — the principal ingredients for making steel, the "master metal" of our industrial age.

These ingredients are stored in huge stock piles at the Inland docks. Daily, thousands of tons of coal are made into coke, and this coke, with iron ore and limestone, is charged into blast furnaces—the first step in making controlled quality steel—the first step in producing the finer things that come to us from out of the ground.

Inland metallurgists are constantly testing and re-testing, melting and re-melting, adding one element and taking away another—always seeking for something better. Already they have contributed many new methods and new steels to American industry.

These, and the newer Inland steels which are coming from continued intensive research, will help you meet the needs of America.

Principal Products: Bars, Floor Plate, Piling, Plates, Reinforcing Bars, Sheets, Strip, Structurals, Tin Plate, Rails, Track Accessories. INLAND STEEL COMPANY, 38 S. Dearborn St., Chicago 3, Ill. *Sales Offices:* Cincinnati, Detroit, Indianapolis, Kansas City, Milwaukee, New York, St. Louis, St. Paul.

INLAND STEEL

The IRON AGE
Sept. 18, 1945

NEWS FRONT

► CIO strike is planned on comprehensive scale for G. M. plants to back up demands for a 30 pct wage increase. Efforts will be made to paralyze the one firm while insuring that work goes forward in all other auto plants.

Layoffs causing drops in membership lists and the possibility of an outburst of adverse public opinion are threatening factors to the strength of the move. Increased wage levels, if obtained, will accelerate the constant effort of the auto industry to make use of more tooling, less labor.

► Additional veteran superseniority cases are causing strife at Nash-Kelvinator and Bohn Aluminum. CIO intends to make a New York City case test in the Supreme Court.

► Middle class German homes are being found a favorite hiding place for Luftwaffe equipment. Burghers claim that the materiel has been forced on them.

► Achievement of speeds exceeding that of sound is the No. 1 postwar problem of military aircraft engineers. Various plans are discussed to get through the structurally dangerous sonic speeds, most likely of which is the use of auxiliary rocket power.

► Steel mill products will continue to require individual licenses for export. Other items in this category are lead, tin, brass, and bronze, electrical industrial equipment and machinery, automobiles, parts, accessories, and service equipment.

► Western steel demand, except for plate, is heavy. The situation at Geneva is indicated by a promise of "air express delivery" for any plate orders in sight.

► Reports state that Ryerson has purchased the site for a warehouse in Los Angeles, and took option for another at Oakland.

► Vast quantities of surplus steel still unreported on the west coast are worrying many a steel man there. One lot of 400,000 tons of unreported steel is mentioned frequently. No shipyard figures are included, nor has the Maritime Commission made any report of inventories.

► Most of RFC's aluminum plants will be cleared of privately owned materials and equipment by Oct. 1. Four offers to lease have been received for the lightmetals plants, including ones from Reynolds Metals, American Smelting and Refining Co., and an important fabricator in the light metals field.

Reports indicate that the original recommendations that the aluminum plants be operated on a super-TVA basis have been rejected.

► Belgium has started exports of iron and steel for November delivery, although only limited quantities are available. Attempts are being made to trade steel for foodstuffs.

Orders for Belgian mills for this year total about 22,000 tons, to go to Spain, Portugal, Switzerland, Turkey, and the Near East.

► The Army now is setting in motion a test program to select peacetime officers. Tests are being sent to the European theatre this week, superseding the historic method of having superior officers "opinion rate" those under their command.

The adjutant general's department, which developed the tests, considers them adequate to result in an 80 pct accurate selection. This is deemed far superior to the results of the haphazard plan used after the last war.

► Orders are expected to be placed soon for three diesel-powered lightweight trains for the Chicago-Florida run. Trains are to be under joint ownership arrangement, costing $1,500,000 each.

► Burlington Railroad has ordered additional "Zephyrs" from Budd, and a 12-car "Empire Builder" from Pullman-Standard. The latter is part of a five-train program with the Great Northern road to modernize Pacific Northwest service.

► Efforts of RFC to get a new bid from U. S. Steel Corp. for the purchase of Geneva, allegedly at President Truman's request, seem doomed to failure. Top heads of the surplus hierarchy are in Europe. Geneva is scheduled to shut down soon in line with terms of lease.

► Backers of the full employment bill are de-emphasizing the government spending aspects of the bill. More important, they assert, are the provisions to adjust taxes to fit any given economic situation, and other measures to level off the peaks of the business cycle, before they become too pronounced.

Time Allowances For Drill-Press Work

. . . Drilling standards evolved by Crane Co. by time studies insure uniform schedules and machining conditions, allow close management control, and provide basis for piecework rates.

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By C. T. POST
Chicago District Editor, THE IRON AGE

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DRILLING, spot facing, tapping, chamfering and bolt-studding operations utilizing single spindle, gang or radial drill presses have been made the basis of time standards and established for use by the standards department of the Chicago works of Crane Co. Such standards have proved valuable in deriving uniform labor costs, maintaining machining schedules and systematizing operations. They also give Crane's shop supervisory personnel a definite control method and assure uniform operating and machining conditions. The time study section fully utilizes these time allowances as an aid in establishing uniform piece work rates.

For a similar study on multiple spindle drilling, see "Time Allowances for Multiple Spindle Drilling," THE IRON AGE, *May* 31, 1945.

The drilling standards cover 18-4-1 standard high-speed steel twist drills, machine ground, and were derived from numerous time studies made in the Crane plant. Several hundred standard model drill presses of various age, make, condition and capacity were covered by the study, and results correlated statistically. The range of diversified operations covered in the Crane shops includes all those involved on this equipment by an extremely large manufacturer of valves and fittings.

Aside from breaking down these related operations into component time value factors, the standards provide for proper selection of equipment to perform a given operation efficiently on the basis of available energy. This selection may be made on the basis of tables I to IV which indicate the amount of energy required for drilling cast brass, mild cast steel, cast iron, and forged steel with various size drills at standard feeds and speeds. The horsepower necessary for the drilling operation under consideration must be available and in excess of the energy necessary to overcome the normal friction losses of the machine itself. For example, an operation involving drilling a standard 1½-in. hole through cast brass is listed, upon consultation of table I, to require 8.24 hp. If the machine under consideration does not have this available power plus that necessary for idle operation, it obviously cannot be used efficiently. Likewise, by consulting the tables, it is possible to avoid tying up more powerful equipment than is necessary for a given operation, thus promoting efficient machine use.

In addition to actual machining time required, a complete operation includes the component time factors for entry of drills into the work material and break-through or overtravel, the necessary handling of product before and after the operation, and machine and tool care.

In determining total distance of tool travel, consideration must be given to:

(1) Length of travel necessary for the point of the twist drill to enter the material.

(2) Total average thickness of material to be drilled, taking into account maximum limits specified on the product drawing or permitted by the inspection department.

(3) Average amount of drill overtravel after breaking through the material, plus an allowance of approximately 1/16 in. to cover possible thickness variations.

Allowance for entry and overtravel is dependent on the angle at which drills must be standard ground for best results (See fig. 1). It is pointed out that drills not machine ground according to this standard practice will produce abnormal strain on machinery and equipment and cause heavy burrs and ridges in the drilled holes. This is particularly true in the more ductile or malleable metals. Use of damaged drills likewise will cause a sharp rise in electric power consumption resulting in undue strain to the motor and the machine. Standard allowances necessary for drill entry and overtravel thus may be computed from the following standard allowances:

Material to be Drilled	Drill Point Angle, Deg.	Overtravel and Drill Point Allowance, Percent of Drill Diameter
Forged steel	65	30
Cast steel	59	37
Cast and forged brass	50	49
Cast iron	45	57

Conversion of the percentages from this table into definite lengths added to the average thickness of the material drilled equals the maximum distance of drill travel necessary to perform the complete drilling operation.

The thickness of the material (plus allowance for entry and overtravel) provides the key to calculation of an accurate total time value for the complete drilling cycle. The revolutions

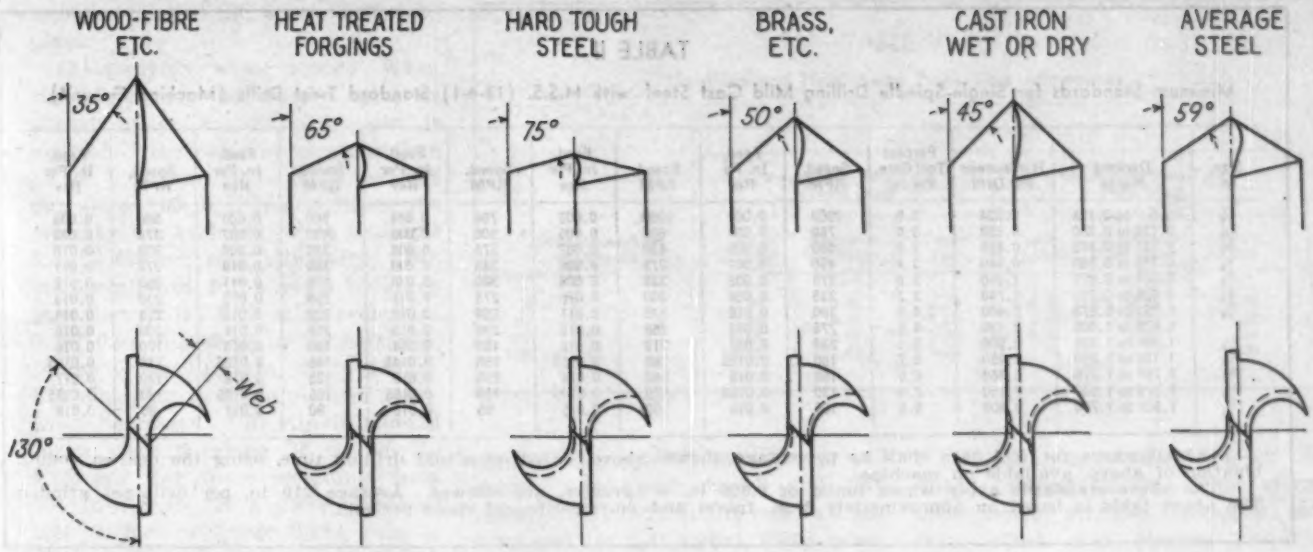

FIG. 1—Drill point angles best suited for materials shown, as recommended by National Twist Drill Co. As webs become wide, thin out as shown by dotted lines.

per minute and feed per revolution at which the machine will operate is indicated by comparison with the table covering the material being drilled (See tables I to IV). With this data, a simple calculation gives an accurate total time value for the actual drilling cycle.

Handling Time Allowances

No time is allowed for any handling or necessary incidental operation which can be performed by the operator during actual machining time or when two or more such elements can be performed at one time by the operator, when possible, to properly utilize both hands. With these exceptions, allowances are made as follows:

(1) PICK UP OR HOIST UP TIME: Operator moves to product, picks it up, transports it to machine work place, and properly places it there. If this operation is performed by hand, 0.015 min is allowed for pieces weighing less than 2 lb; 0.03 min, 2 to 5 lb; 0.045 min, 6 to 15 lb; or 0.07 min, 16 to 35 lb. If the product is hoisted into place with air cylinder, air or electric motor, or chain hoist, allowance is made for operator moving to the piece, lowering or raising hoist and properly grasping it, raising it to the necessary height, returning to work place, properly placing piece, releasing hoist and placing it aside. Time allowances are those shown in table V.

(2) POSITION JIG: Time allowance is for picking up jig and positioning it over work piece. For a loose jig weighing less than 2 lb and requiring no locking, 0.02 min is allowed; 0.03 min, over 2 to 5 lb; 0.04 min, 6 to 15 lb; and 0.06 min, 16 to 35 lb. For a locking type jig 0.02 min is allowed for each thread and 0.025 min for the final twist to tighten each wing nut or thumb screw. For attaching each C-type clamp to jig with wrench, 0.12 min is allowed for each clamp up to 3 in.; 0.20 min if over 3 in.; and 0.12 min if over 3 and less than 6 in. Other time allowances, when applicable are 0.07 min for attaching each plier grip clamp; 0.015 min for swinging lock lever, up to 12 in. on jig; 0.01 min for swinging hinged bushing, weighing up to 2 lb, on jig; and 0.05 min for

TABLE I

Minimum Standards for Single-Spindle Drilling Cast Brass With H.S.S. (18-4-1) Standard Twist Drills (Machine Ground)

Size, In.	Decimal Range	Horsepower Per Drill	Percent Tool Care, Per (a)	Speed, RPM	Feed, In. Per Rev	Speed, RPM	Feed, In. Per Rev	Speed, RPM	Feed, In. Per Rev	Speed, RPM	Feed, In. Per Rev	Speed, RPM	Feed, In. Per Rev
1/16	0.0 to 0.062	0.18	4.8	5000	0.0015	3700	0.002	3000	0.0025				
1/8	0.063 to 0.125	0.23	4.8	4000	0.002	2670	0.003	2000	0.004	1600	0.005	1330	0.006
1/4	0.126 to 0.250	0.44	5.6	2000	0.004	1600	0.005	1330	0.006	1140	0.007	1000	0.008
3/8	0.251 to 0.375	0.80	6.8	1330	0.006	1140	0.007	1000	0.008	885	0.009	800	0.010
1/2	0.376 to 0.500	1.26	7.4	1140	0.007	1000	0.008	885	0.009	800	0.010	725	0.011
5/8	0.501 to 0.625	1.76	8.4	1000	0.008	885	0.009	800	0.010	725	0.011	665	0.012
3/4	0.626 to 0.750	2.40	9.6	885	0.009	800	0.010	725	0.011	665	0.012	615	0.013
7/8	0.751 to 0.875	3.00	11.2	800	0.010	725	0.011	665	0.012	615	0.013	570	0.014
1	0.876 to 1.000	3.84	12.6	725	0.011	665	0.012	615	0.013	570	0.014	465	0.015
1 1/8	1.001 to 1.125	4.80	14.4	585	0.012	540	0.013	500	0.014	465	0.015	345	0.016
1 1/4	1.126 to 1.250	5.84	16.0	480	0.0125	445	0.0135	415	0.0145	385	0.0155	300	0.0165
1 3/8	1.251 to 1.375	6.98	17.6	429	0.013	390	0.014	365	0.015	345	0.016	235	0.017
1 1/2	1.376 to 1.500	8.24	19.2	370	0.0135	345	0.0145	320	0.0155	300	0.0165	225	0.0175
1 3/4	1.501 to 1.750	11.00	21.0	285	0.014	265	0.015	250	0.016	235	0.017	220	0.018

(a) Allowance for tool care shall be percentage shown above, based on actual drilling time, using the nearest combination of above, available on machine.

The above standards apply where limits of 0.005 in. or greater, are allowed. Average 200 in. per drill per grind. The above table is based on approximately 8 in. travel and 130-ft peripheral speed per min.

TABLE II

Minimum Standards for Single-Spindle Drilling Mild Cast Steel with H.S.S. (18-4-1) Standard Twist Drills (Machine Ground)

Size, In.	Decimal Range	Horsepower Per Drill	Percent Tool Care, Per (a)	Speed, RPM	Feed, In. Pe Rev	Speed, RPM	Feed, In. Per Rev	Speed, RPM	Feed, In. Per Rev	Speed, RPM	Feed, In. Per Rev	Speed, RPM	Feed, In. Per Rev
1/8	0.0 to 0.125	0.224	3.0	1500	0.002	1000	0.003	750	0.004	600	0.005	500	0.006
1/4	0.126 to 0.250	0.350	3.0	750	0.004	600	0.005	500	0.006	430	0.007	375	0.008
3/8	0.251 to 0.375	0.625	3.2	500	0.006	430	0.007	375	0.008	335	0.009	300	0.010
1/2	0.376 to 0.500	0.940	3.4	430	0.007	375	0.008	335	0.009	300	0.010	275	0.011
5/8	0.501 to 0.625	1.250	3.5	375	0.008	335	0.009	300	0.010	275	0.011	250	0.012
3/4	0.626 to 0.750	1.740	3.7	335	0.009	300	0.010	275	0.011	250	0.012	230	0.013
7/8	0.751 to 0.875	2.400	4.0	300	0.010	275	0.011	250	0.012	230	0.013	215	0.014
1	0.876 to 1.000	3.130	4.5	275	0.011	250	0.012	230	0.013	215	0.014	200	0.015
1 1/8	1.001 to 1.125	4.000	5.1	230	0.012	210	0.013	195	0.014	180	0.015	170	0.016
1 1/4	1.126 to 1.250	4.950	5.7	180	0.0125	165	0.0135	155	0.0145	145	0.0155	135	0.0165
1 3/8	1.251 to 1.375	5.950	6.5	155	0.013	140	0.014	130	0.015	125	0.016	120	0.017
1 1/2	1.376 to 1.500	7.150	7.4	130	0.0135	120	0.0145	110	0.0155	105	0.0165	100	0.0175
1 3/4	1.501 to 1.750	9.600	8.4	105	0.014	100	0.015	95	0.016	90	0.017	85	0.018

(a) Allowance for tool care shall be percentage shown above, based on actual drilling time, using the nearest combination of above, available on machine.

The above standards apply where limits of 0.005 in. or greater, are allowed. Average 210 in. per drill per grind. The above table is based on approximately 3 in. travel and 60-ft peripheral speed per min.

TABLE III

Minimum Standards for Single-Spindle Drilling Cast Iron With H.S.S. (18-4-1) Standard Twist Drills (Machine Ground)

Size, In.	Decimal Range	Horsepower Per Drill	Percent Tool Care, Per (a)	Speed, RPM	Feed, In. Per Rev	Speed, RPM	Feed, In. Per Rev	Speed, RPM	Feed, In. Per Rev	Speed, RPM	Feed, In. Per Rev	Speed, RPM	Feed, In. Per Rev
1/8	0.0 to 0.125	0.20	2.5	3000	0.002	2000	0.003	1500	0.004	1200	0.005	1000	0.006
1/4	0.126 to 0.250	0.32	2.6	1500	0.004	1200	0.005	1000	0.006	860	0.007	750	0.008
3/8	0.251 to 0.375	0.56	2.8	1000	0.006	860	0.007	750	0.008	670	0.009	600	0.010
1/2	0.376 to 0.500	0.86	3.0	860	0.007	750	0.008	670	0.009	600	0.010	540	0.011
5/8	0.501 to 0.625	1.22	3.3	750	0.008	670	0.009	600	0.010	540	0.011	500	0.012
3/4	0.626 to 0.750	1.62	3.6	670	0.009	600	0.010	540	0.011	500	0.012	460	0.013
7/8	0.751 to 0.875	2.00	4.0	600	0.010	540	0.011	500	0.012	460	0.013	430	0.014
1	0.876 to 1.000	2.60	4.6	540	0.011	500	0.012	460	0.013	430	0.014	400	0.015
1 1/8	1.001 to 1.125	3.32	5.2	420	0.012	385	0.013	360	0.014	330	0.015	310	0.016
1 1/4	1.126 to 1.250	4.10	5.8	320	0.0125	300	0.0135	275	0.0145	260	0.0155	240	0.0165
1 3/8	1.251 to 1.375	4.94	6.4	270	0.013	250	0.014	235	0.015	220	0.016	205	0.017
1 1/2	1.376 to 1.500	5.90	7.0	220	0.0135	210	0.0145	190	0.0155	180	0.0165	170	0.0175
1 3/4	1.501 to 1.750	8.00	7.6	180	0.014	165	0.015	155	0.016	145	0.017	135	0.018

(a) Allowance for tool care shall be percentage shown above, based on actual drilling time, using the nearest combination of above, available on machine.

The above standards apply where limits of 0.005 in. or greater, are allowed. Average 415 in. per drill per grind. The above table is based on approximately 6 in. travel and 65-ft peripheral speed per min.

TABLE IV

Minimum Standards for Single-Spindle Drilling Forged Steel with H.S.S. (18-4-1) Standard Twist Drills (Machine Ground)

Size, In.	Decimal Range	Horsepower Per Drill	Percent Tool Care, Per (a)	Speed, RPM	Feed, In. Per Rev	Speed, RPM	Feed, In. Per Rev.	Speed, RPM	Feed, In. Per Rev	Speed, RPM	Feed, In. Per Rev	Speed, RPM	Feed, In. Per Rev
1/8	0.0 to 0.125	0.23	2.0	1600	0.002	1070	0.003	800	0.004	640	0.005	535	0.006
1/4	0.126 to 0.250	0.36	2.0	800	0.004	640	0.005	535	0.006	460	0.007	400	0.008
3/8	0.251 to 0.375	0.64	2.2	535	0.006	460	0.007	400	0.008	355	0.009	320	0.010
1/2	0.376 to 0.500	0.96	2.4	460	0.007	400	0.008	355	0.009	320	0.010	290	0.011
5/8	0.501 to 0.625	1.28	2.5	400	0.008	355	0.009	320	0.010	290	0.011	285	0.012
3/4	0.626 to 0.750	1.78	2.7	355	0.009	320	0.010	290	0.011	265	0.012	245	0.013
7/8	0.751 to 0.875	2.50	3.0	320	0.010	290	0.011	265	0.012	243	0.013	230	0.014
1	0.876 to 1.000	3.20	3.5	290	0.011	265	0.012	245	0.013	230	0.014	210	0.015
1 1/8	1.001 to 1.125	4.10	4.0	240	0.012	220	0.013	200	0.014	190	0.015	175	0.016
1 1/4	1.126 to 1.250	5.10	4.5	200	0.0125	185	0.0135	170	0.0145	160	0.0155	150	0.0165
1 3/8	1.251 to 1.375	6.10	5.0	170	0.013	160	0.014	150	0.015	140	0.016	130	0.017
1 1/2	1.376 to 1.500	7.30	5.5	148	0.0135	138	0.0145	128	0.0155	120	0.0165	114	0.0175
1 3/4	1.501 to 1.750	9.80	6.0	132	0.014	123	0.015	115	0.016	108	0.017	103	0.018
2	1.751 to 2.000	....	6.6	110	0.0145	103	0.0155	97	0.0165	92	0.0175	87	0.0185
2 1/4	2.001 to 2.250	....	7.2	93	0.015	87	0.016	82	0.017	78	0.018	74	0.019
Second Drilling													
2 1/2	2.251 to 2.500	....	8.0	83	0.015	78	0.016	74	0.017	70	0.018	66	0.019
2 3/4	2.501 to 2.750	....	8.8	66	0.015	62	0.016	59	0.017	55	0.018	52	0.019
3	2.751 to 3.000	....	10.0	45	0.015	42	0.016	39	0.017	37	0.018	35	0.019

(a) Allowance for tool care shall be percentage shown above, based on actual drilling time, using the nearest combination of above, available on machine.

The above standards apply in cases where limits of 0.005 in. or greater, are allowed. Average 550 in. per drill per grind. The above table is based on approximately 3.2 in. travel and 65-ft. peripheral speed per min.

swinging hinged jig, up to 25 lb, into place.

(3) POSITION WORK PIECE: When the piece may be merely solid or placed under spindle, 0.01 min is allowed if the piece weighs less than 15 lb; 0.02 min, 16 to 35 lb, or 0.05 min, 36 to 100 lb. For positioning the piece on the table, in or on a simple fixture for accurate alignment, 0.018 min is allowed for a piece weighing less than 2 lb; 0.02 min, over 2 to 5 lb; 0.04 min, 6 to 15 lb; 0.07 min, 16 to 35 lb; 0.10 min, 36 to 100 lb. For clamping to angle plate or table, when necessary, 0.20 min is allowed for a piece weighing 36 to 100 lb; 0.25 min for piece weighing from 101 to 500 lb. If a piece is placed into a fixture loose, 0.015 min is allowed for a piece weighing less than 5 lb; 0.02 min for 5 to 15 lb; or 0.035 min from 16 to 35 lb. Allowance also is made, when applicable, for picking up piece, placing it into a chuck and tightening the chuck. This allowance, for a universal chuck is 0.15 min for a piece weighing 5 to 15 lb or 0.20 min for a piece weighing 16 to 35 lb; for a two jaw chuck, 0.18 min for a piece weighing 5 to 15 lb; and 0.25 min for a piece weighing 16 to 35 lb.

(4) APPLY CUTTING FLUID: Allowance of 0.03 min is made for applying cutting fluid to tool or piece with a hand brush.

(5) LOWER SPINDLE: Allowance is made for reaching for handle and pulling down on various types of machines as follows: For Allen, Leland-Gifford, Delta, Cincinnati-Bickford, Canedy-Otto, and Avey drilling machines, 0.01 min; 3-ft radial, 0.15 min; 4-ft radial, 0.02 min; 5-ft radial, 0.03 min; 6-ft radial, 0.04 min.; and Minster and Baker drill presses, 0.03 min.

(6) ENGAGE FEED: Allowance for the first six makes listed in (5) above, 0.015 min is allowed, and for Minster, Baker and all radial drills, 0.02 min.

Allowance for the drilling operation is made as outlined previously. Following the drilling operation, these additional allowances are made.

(7) RAISE SPINDLE: For pulling up and releasing handle 0.005 min is allowed for Allen, Leland-Gifford, Delta, Cincinnati, Canedy-Otto, and Avey drilling machines; 0.015 for 3 and 4-ft radial; 0.025 min for 5-ft radial; 0.04 min for 6-ft radial, and 0.03 min for Minster and Baker machines. When another operation is to follow in sequence, allowance is made for raising or lowering spindle to clear piece or jig only, as follows: For Allen, Leland-Gifford, Delta, Cincinnati, Canedy-Otto, and Avey machines, 0.005 min; for 3 and 4-ft radial, 0.01 min; for 5-ft radial, 0.013 min; and for 6-ft radial, 0.015 min.

(8) MOVE OR TURN PIECE TO NEXT HOLE: Allowance is made according to approximate weight of piece as follows: Less than 2 lb, 0.01 min; 2 to 10 lb, 0.02 min; 11 to 35 lb, 0.03 min; 36 to 60 lb, 0.04 min; 61 to 100 lb, 0.06 min; and 101 to 300 lb, 0.08 min. For a loose piece or one in a fixture on ways, allowance is made for moving piece to next spindle of 0.015 min for pieces weighing less than 5 lb; 0.02 min, 5 to 10 lb; and 0.04 min, 11 to 35 lb. For moving radial arm on radial machines to next position, 0.025 min is allowed for 3-ft radial machine; 0.03 min, 4-ft radial, 0.04 min, 5-ft radial and 0.05 min, 6-ft radial.

(9) SWING IN ARM TOWARD WORK POSITION: Allowance for 3-ft radial is 0.04 min; 4-ft radial 0.06 min; 5-ft radial 0.08 min, and 6-ft radial, 0.10 min.

Again, allowance is made for drilling operation as previously explained.

(10) SWING OUT ARM AWAY FROM WORK POSITION: 0.03 min if allowed for 3-ft radial machines; 0.04 min for 4-ft radial; 0.05 min for 5-ft radial, and 0.08 min for 6-ft radial.

(11) CHANGE TOOLS IN "MAGIC" OR QUICK CHANGE CHUCK: Time allowance which includes releasing tool from chuck and placing properly aside, picking up next tool and attaching to chuck spindle is based on the average length of tool including sleeve. If this average length is less than 8 in., 0.06 min is allowed; 8 to 12 in., 0.08 min; and over 12 in., 0.10 min.

(12) DUMP CHIPS FROM HOLE: For pieces weighing less than 2 lb; 0.01 min, and for 2 to 5 lb pieces, 0.015 min is allowed for picking up piece, dumping chips and replacing piece. For blowing chips from hole with air hose, 0.02 min is allowed per hole, plus 0.04 min for picking up and placing away air hose.

(13) FOR INDEXING LOCKING FIXTURE TO NEXT WORK POSITION: 0.02 min is allowed for pieces weighing less than 4 lb; 0.03 min, over 4 to 12 lb; and 0.04 min, 13 to 35 lb. For turning piece in loose jig or fixture 0.15 min is allowed when the approximate weight of fixture plus piece is less than 3 lb; 0.02 min from over 3 to 6 lb; 0.03 min, 7 to 15 lb; 0.05 min, 16 to 35 lb.

(14) FOR SLIDING OUT JIG AND/OR PIECE FROM UNDER SPINDLE: 0.01 min is allowed if approximate total weight is less than 2 lb; 0.015 min from over 2 to 5 lb; 0.02 min, 6 to 15 lb; 0.04 min, 16 to 35 lb; 0.05 min, 36 to 100 lb.

(15) LOOSEN THUMB SCREW OR WING NUT ON JIG: For each turn of screw necessary, 0.01 min is allowed per thread plus 0.02 min for initial start.

(16) REMOVE CLAMPS: Allowance per clamp is made as follows:

C Clamps

	Size, In.	
	3 or less	*Over 3.0 to 6*
Allowed time, min		
With wrench	0.07	0.11
With wing nut	0.05	0.07

TABLE V

Hoist-Up and Hoist-Away Piece Time Allowances

Weight Range of Product, Lb	Time Allowed, Min					
	Hook or Sling-Hook Type of Hoist Grasp			Chain-Wrap Sling-Type Hoist Grasp		
	Air Cylinder	Electric or Air Motor	Chain Fall	Air Cylinder	Electric or Air Motor	Chain Fall
36 to 100	0.30	0.45	0.70	0.35	0.55	0.75
101 to 500	0.45	0.65	1.00	0.55	0.75	1.00
501 to 1200	0.65	0.85	1.25	0.75	1.00	1.40
1201 to 2000	0.85	1.00	1.75	1.00	1.25	2.00

TABLE VI

Standard Allowance for Proper Care of High-Speed Steel Twist Drills (Machine Ground)

Size of Drill, In.	Decimal Range	Allowance Per Drill, Min
1/8	0.0 to 0.125	1.20
1/4	0.126 to 0.250	1.42
3/8	0.251 to 0.375	1.64
1/2	0.376 to 0.500	1.84
5/8	0.501 to 0.625	2.10
3/4	0.626 to 0.750	2.40
7/8	0.751 to 0.875	2.80
1	0.876 to 1.000	3.15
1 1/8	1.001 to 1.125	3.60
1 1/4	1.126 to 1.250	4.00
1 3/8	1.251 to 1.375	4.40
1 1/2	1.376 to 1.500	4.80
1 3/4	1.501 to 1.750	5.25

TABLE VII

Minimum Standards for Tapping Bonnet End for Studs. Complete Actual Tapping Time (In and Out) per Thread

Tap Size				
Size, In.	Threads, Per In.	Cast Iron	Forged or Cast Steel	Forged or Cast Brass
3/8	16	0.005	0.0055	0.004
7/16	14	0.0055	0.006	0.0045
1/2	13	0.006	0.0065	0.005
9/16	12	0.0065	0.007	0.0055
5/8	11	0.007	0.0075	0.006
3/4	10	0.0085	0.009	0.007
7/8	9	0.010	0.0105	0.008

Allowance to operator for tap care shall be 4 pct of the total actual tapping time as based on above table.

TABLE VIII

Minimum Standards for Chamfering

	Up to 2-In. Diameter Hole Brass, Cast Iron, Cast or Forged Steel	Over 2-In. to 4-In. Diameter Hole Brass, Cast Iron, Cast or Forged Steel
For burring only	0.01	0.02
To specific dimensions	0.025	0.04

TABLE IX

Minimum Standards for Spot Facing, Including Turning and Locating Under Tool (Allowed time per hole, Min.)

	Diameter of Spot Face					
Depth, In.	To 1 In.	1¼ In.	1½ In.	1¾ In.	2 In.	2¼ In.
Brass (from top)						
1/16	0.045	0.05	0.06	0.07	....	....
1/8	0.07	0.08	0.095	0.11	....	....
Forged and cast steel (from top)						
1/32	0.055	0.06	0.07	0.08	0.10	....
1/16	0.09	0.11	0.13	0.16	0.19	....
1/8	0.14	0.16	0.18	0.21	0.26	....
1/4	0.20	0.24	0.28	0.32	0.36	....
Cast steel (through hole)						
1/16	....	....	....	....	....	....
1/8	....	....	....	0.33	0.36	0.40

Allowance to operator for spot-facing tool care shall be 4 pct of the total actual time required for cutter contact as based on the above table.

TABLE X

Minimum Standards for Driving in Studs

	All Materials						
Size, In.	3/8	1/2	5/8	3/4	7/8	1	1 1/8
Automatic stud driver (complete) Allowed time, Min.	0.045	0.05	0.055	0.06	0.07	....	....
Reversing stud driver Allowed time, Min.	0.15	0.16	0.18	0.20	0.23	0.26	0.30

Bolted Clamps	*Size, In.*		
	4	5	6
Allowed time, min			
With wrench	0.10	0.15	0.20

Plier Grip	*All sizes*
Allowed time, min	0.04

(17) FOR REMOVING JIG AND PLACING TO SIDE: Allowance of 0.02 min is made for jigs weighing less than 2 lb; 0.03 min, over 2 to 5 lb; 0.045 min, 6 to 15 lb; 0.07 min, 16 to 35 lb; and 0.05 min for swing-type jig.

(18) START STUDS: Allowance is for picking up stud, air brushing and starting stud in tapped hole only. Allowance per stud as stated above for 3/8-in. size is 0.04 min; 1/2-in. size, 0.045 min; 5/8-in. size, 0.05 min; 3/4-in. size, 0.06 min; 7/8-in. size, 0.07 min; 1-in. size, 0.08 min; 1 1/8-in. size, 0.09 min.

(19) POSITION SURFACE GUARD PLATE: Allowance of 0.04 min per each time position is made for picking up guard plate from bench or from work position on studs and replacing so as to protect surface from stud driver.

Tables VII to X show standard times that were worked out for tapping, chamfering, and spot facing as well as driving of studs in the bonnet end of valve bodies. These operations are so general in nature and unrelated to specific designs, however, that the time study data should be adaptable to any type of product involving such basic operations.

Machine Care Time

Allowance for machine care is 4 pct of work day time, as compiled from tables I to IV. Machine care is defined as consisting of the following items:

(1) At the beginning of work day period, operator shall properly lubricate all points of the machine that require daily care, based on machine manufacturer's recommendations.

(2) Check lubrication points at necessary intervals during work period, and add or lubricate when required.

(3) Keep machine clear and immediate work place in proper order consistent with good shop practice and to productive supervision's satisfaction.

(4) Clean machine of chips, and clear work place area, or equipment

utilized to shop supervision's satisfaction, at end of productive day.

Standard tool care consists of the machine operator removing tools from their spindles or holders after they have completed their function, transporting them to the proper sectional tool crib for standard grinding, receiving them or a duplicate set from the crib, returning to the machine, inserting the tools into their respective spindles or holders, and performing whatever adjustments are necessary to assure proper performance. Time allowances in percent per drill, as derived from tables I to IV, are the basic standard as proven by general shop practice and checked by accumulated data from time study and observation. Standard allowances in minutes are shown in table VI. The basic data are derived from the average number of inches possible to drill in the various metals specified consistent with utmost tool economy and maximum production and conforming to the fundamentals of good shop practice. Analysis of accumulated data made possible a conclusive arrival at a definite number of inches per minute which can be drilled in the various metals consistently.

Any production routine, it is recognized, is varied by unusual conditions or elements not possible to take into account in setting up standards. These situations are considered individually, and allowances made and shown according to actual time necessary.

An Adjustable-Range Force-Measuring Spring

A NEW type force-measuring beam provides comparable deflections under such widely divergent load ranges as 0 to 4000 lb, 0 to 20,000 lb, and the maximum, 0 to 100,000 lb. Developed by M. J. Manjoine of the Westinghouse research laboratories, this new measuring beam has a stiffness which can be varied in accordance with the desired load range when applied to an automatic creep testing machine.

In most testing machines it is necessary to change the force-measuring system when testing materials requiring widely varying loads. If the usual force-measuring spring is made with sufficient strength and stiffness to withstand maximum loads of perhaps 40,000 to 50,000 lb, it is so designed that the deflection under such loads is substantial and easily measured with an extensometer. For light loads the deflection of such a spring is obviously smaller, with corresponding decrease in measurement accuracy.

One conventional type of equipment used in creep testing materials in tension is shown in Fig. 1. The screw jack exerts a force on the bottom of the slotted force-measuring bar, shown in detail in Fig. 2. An extensometer is mounted on the top of the bar and its probe extends down through a vertical hole in the bar and rests against the top of the lower section. When the necessary force is applied by the motor-driven screw jack, the force-measuring spring is deflected a certain distance. Contacts in the extensometer, through electrical controls, limit this deflection (hence the applied force) by stopping the drive motor. When the material under test elongates to such an extent that

(CONTINUED ON PAGE 163)

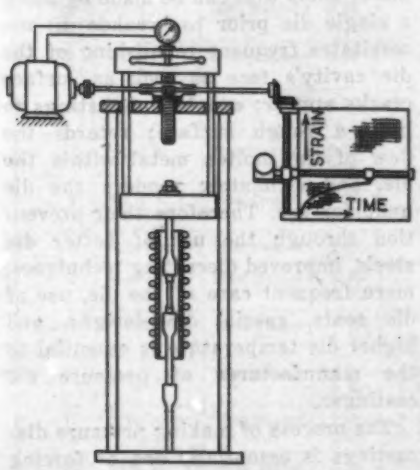

FIG. 1—Diagrammatic layout of an automatic machine for recording creep-to-rupture data.

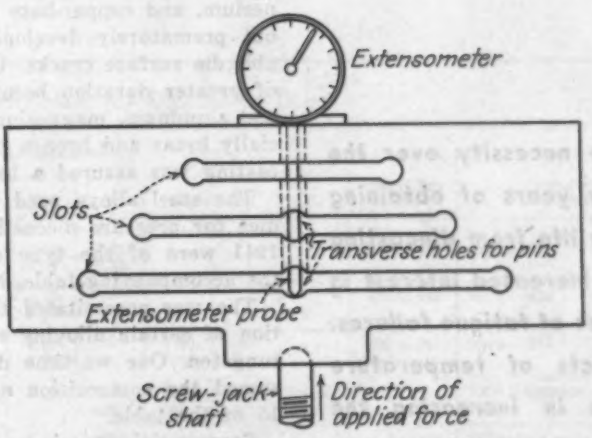

FIG. 2—A sketch of the conventional force measuring bar.

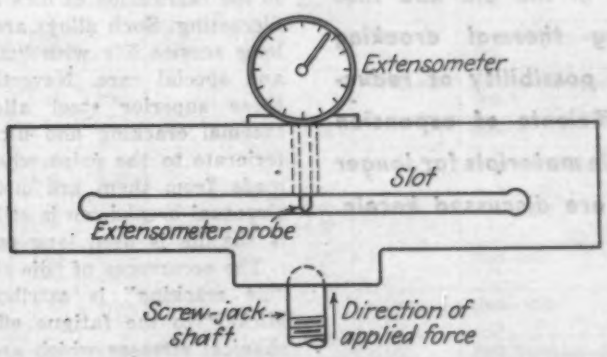

FIG. 3—The transverse holes in the center of the slots permit the use of this weighing spring over a number of ranges.

Checking Of Diecasting Dies

o o o

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o o o

. . . The necessity over the past few years of obtaining maximum life from diecasting dies has increased interest in the causes of fatigue failures. The effects of temperature gradients in increasing the compressive and tensile stresses in the die and thus hastening thermal cracking and the possibility of reducing coefficients of expansion of new die materials for longer die life are discussed herein.

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FOR many years prior to 1930 the production of pressure diecastings from high melting point alloys was rendered difficult by the lack of suitable die steels. Those available for use failed to give satisfactory service for large quantity production; they manifested undesirable surface cracks after as few as a hundred shots. These cracks appeared on the die surface within the cavity as tiny hair thin lines which rapidly enlarged and spread over the entire die cavity's surface. The presence of these cracks on the surface of the die cavity caused the finish of the pressure diecastings made within the cavity to exhibit an undesirable surface roughness in the form of myriad tiny raised fins. As the cracks enlarged the surface finish of the pressure diecastings became progressively inferior and finally rendered the castings unfit for use.

The years from 1930 to 1940 witnessed the development of greatly improved steel alloys suitable for the construction of dies for pressure diecastings. (See the accompanying table.) These die steels could withstand the frequent, severe thermal shock of casting with high melting point alloys such as aluminum, magnesium, and copper-base alloys without prematurely developing undesirable die surface cracks. Casting runs of greater duration became possible, and aluminum, magnesium, and especially brass and bronze pressure diecasting was assured a bright future.

The steel alloys used to fabricate dies for pressure diecasting prior to 1941 were of the type described in the accompanying table, Nos. 1 to 14.

The war necessitated the substitution of certain alloying elements for tungsten. One wartime die steel assumed the composition noted in No. 15 of the table.

Commercial experience has proved the superiority of certain steel alloys in the fabrication of dies for pressure diecasting. Such alloys are capable of long service life with little attention and special care. Nevertheless even these superior steel alloys exhibit thermal cracking and ultimately deteriorate to the point where castings made from them are unsatisfactory. Eventual breakdown is still inevitable if the die is used long enough.

The occurrence of "die checking" or "die cracking" is attributed by E. Mickel* to the fatigue effect of mechanical stresses which are set up in the die by temperature differences within the die. The constant repetition of these stresses as a consequence of the succession of shots during the use of the die causes fatigue failure of the die surface. Certain steels are capable of withstanding many thousand such fatigue stresses in succession, while others rupture after only a few hundred.

The presence of cracks on the surface of the die roughens the finish of the pressure diecastings made in the dies, and renders the castings unsuitable for many uses.

If a given die manifests cracks before the required number of the diecastings from that die are cast, it becomes necessary to construct another die in order to finish the run and make the remaining castings. Needless to say, this is expensive and adds greatly to the piece price of the castings. If, as is usually the case, the manufacturer has contracted at a certain piece price, the added expense of a second unexpected die construction may increase the cost of manufacture to the point where little or no profit is realized.

War demands made it essential to get the maximum use out of dies for diecasting. Longer runs with fewer die failures spell increased production. Increased rate of production places a severe strain on the capacity of a given die by necessitating more drastic cooling of the dies in order to permit rapid solidification of the molten metal and subsequent fast ejection of the castings from the die as they are cast. This drastic cooling places a strain on the die for it increases thermal shock and engenders higher internal surface stresses.

The presence of die cracks shortens die life. This requires the use of two or more dies when the number of castings to be made exceeds the number of shots that can be made by using a single die prior to breakdown; necessitates frequent repolishing of the die cavity's face as soon as surface cracks appear; causes the castings to have a rough surface; retards the flow of the molten metal within the die, and ultimately renders the die unfit for use. Therefore their prevention through the use of better die steels, improved diecasting techniques, more frequent care of the die, use of die coats, special die designs, and higher die temperature is essential to the manufacturer of pressure die castings.

The process of making pressure diecastings is essentially one of forcing molten metal into the die cavity under pressure where it solidifies as a result of the abstraction of heat from the

**Die Stresses, Metal Industry, May 4, 1945.*

molten metal by the steel die. The filling of the die cavity with molten metal is usually accomplished in a fraction of a second.

Prior to the entrance of the molten metal into the die cavity, the die temperature as a whole is much lower than the temperature of the molten metal. Usually the difference is in the order of more than 572° F.

The molten metal fills the die suddenly raising the temperature of the die face quickly to a temperature equal to that of the molten metal. The surface of the die cavity as a result of its increased temperature tends to expand appreciably. The underlying layers of metal below the surface are not raised to such a high temperature as quickly as the die surface. A pronounced temperature gradient is created between the underlying layers and the surface layer. The duration of this gradient is of sufficient length to permit the formation of a stress within the surface. The underlying layers tend to hinder the expansion of the surface layer which is thereby subjected to compressive stress of sufficient magnitude to deform the die cavity surface plastically. As the temperature of the die surface and the underlying layers approach one another as a consequence of the transmission of heat into the die proper from the cavity surface, the interior of the die tends to expand and the surface layers having cooled will tend to contract, but their contraction will be prevented by the expansion of the underlying layers. The result is that the surface layers are now placed in a state of tension sufficient to cause plastic deformation.

Each time the die is filled the die surface is therefore subject first to a compression stress, then to a tension stress. Fatigue failure results if this cycle is repeated frequently enough and cracks appear.

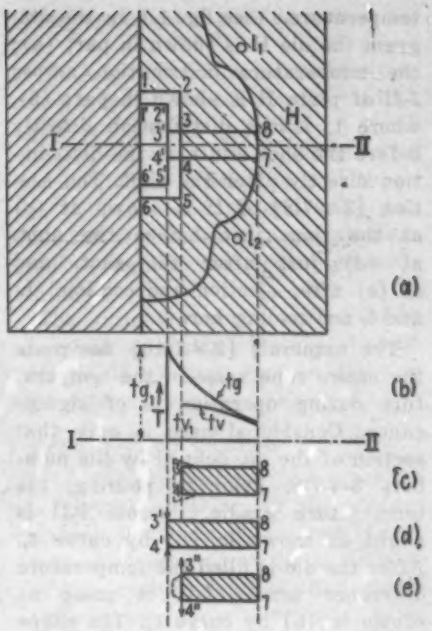

FIG. 1—Schematic presentation of the thermal behavior of a die casting die during and after filling with molten casting metal. Part (a) shows the die with die cavity 1-2-3-4-5-6. Part (b) depicts the temperature distribution where t_v is the temperature gradient across the section 3-8-7-4 of the die H through the plane I-II just before the casting metal fills the die and the t_z is the temperature gradient across the same section through the same plane just after the casting metal has filled the die. T_{v_1} represents the temperature of the die face prior to the entrance of the molten metal and t_{z_1} represents the temperature of the die face after the entrance of the molten metal. The dotted lines in (c) illustrate the manner in which the section 3-8-7-4 tends to expand because of the high temperature at 3-4. In (d) section 3-8-7-4 is shown in the shape it finally assumes as it expands along I-II. Arrows indicate the direction of the stresses at 3'-4'. In "e" dotted lines illustrate how the section 3-8-7-4 tends to contract once the temperature of the die face 3"-4" has cooled down. Arrows indicate the direction of the stresses at 3"-4".

*Leopold Frommer, Spritzgass technik, Julius Springer, Berlin, 1933.

Frommer* has presented an excellent illustration of the manner in which a die shape varies with varying

Some Suggested Steels for Diecasting Dies

No.	Material to Be Cast	Condition of the Die	Steel Analysis, Pct									Required Bhn	Source of Data (Authority)
			C	Mn	Si	W	Cr	V	Mo	Ni	Co		
1	Mg or Al	Heat treated	0.40-0.50	0.40-0.80	0.30		2.00-2.50	0.15-0.30				387 to 440	Herb—1936
2	Mg or Al	Heat treated	0.30-0.40	0.20-0.35	0.80-1.00	4.00-5.00	4.75-5.75					402 to 460	Herb—1936
3	Mg or Al	Heat treated	0.30-0.40	0.20-0.35	0.80-1.00	0.75-1.25	4.50-5.00		1.00-1.50			402 to 460	Herb—1936
4	Mg or Al	Heat treated	0.35		0.90	4.50	5.25	0.25 opt.	0.50 opt.	0.50 opt.	0.50 opt.		ASM Handbuch 1939
5	Mg or Al	Heat treated	0.30	0.60	0.90		5.00	0.25 opt.	1.00				ASM Handbuch 1939
6	Mg or Al	Heat treated	0.30		0.90	1.00	5.00	0.25 opt.	1.00		0.50 opt.		ASM Handbuch 1939
7	Mg or Al	Heat treated	0.25-0.30			9.50-10.50	2.50-3.00		0.20-0.35	1.25-1.50		444 to 460	Personal Correspondence 1945
8	Mg or Al	Heat treated	0.30-0.35			9.75-10.75	2.75-3.25	0.40-0.60				444 to 460	Personal Correspondence 1945
9	Al or bronze	Heat treated	0.37			4.50	5.25				0.50		Frommer—1933
10	Al or bronze	Heat treated	0.30-0.40		0.25	10.00	3.00-3.80	0.10-0.30					Frommer—1933
11	Al or bronze	Heat treated	1.40-1.50				12.00-13.00		0.50-0.60		3.00-4.00		Herb—1936
12	Al or bronze	Heat treated	0.35-0.45	0.20-0.35		8.00-10.00	2.50-3.50	0.30-0.60					Herb—1936
13	Al or bronze	Heat treated	0.25-0.35	0.20-0.35	0.35	12.00-16.00	2.50-3.25	0.30-0.60					Herb—1936
14	Bronze	Heat treated	0.35			10.00	3.00	0.50					ASM Handbuch—1939
15	Bronze	Heat treated	0.55				4.00	1.00	0.50			430	Western Die Casting Co.—1943

temperature. (see fig. 1.) In the diagram the die H is shown in part (a); the temperature distribution across I-II of plate H is shown in part (b), where t_v is the distribution directly before the shot and t_g is the distribution directly after the shot. The section [3-4-7-8] of H is shown at (c) at the time just before the shot, at (d) just after the shot, and at (e) after ejection and cooling. L_1 and l_2 are cooling bores.

The numerals [9-8-7-10] designate the entire zone wherein the temperature during operation is of significance. Considered here is only that section of the die defined by the numbers 3-4-7-8. Prior to pouring, the temperature gradient across I-II is slight as shown in (b) by curve t_v. After the die is filled the temperature difference across I-II is steep as shown in (b) by curve t_g. The shape of the curves t_v and t_g depends upon the temperature of the alloy and the thermal conductivity of the die material and the casting metal.

When the section [3-4-7-8] rises in temperature it tends to assume the form of the dotted lines in (c). It is, however, prevented from assuming this shape—expansion in the direction 4-3 is impossible, so it assumes the shape shown in (d) as a result of expanding in the direction 8-3. Similarly the entire die takes the shape 1'-6' just after a shot, with compressive stress indicated by arrows in (d).

If the die is perfectly elastic it will regain its shape when all this stress is relieved. If its elastic limit is passed in the outer shell of die, the tendency is to take on the shape in (e) as outlined by dotted lines, but instead the die is forced to take the form [3"-4"-7-8] with expanding stress as indicated.

E. Mickel has demonstrated that the surface temperature the die cavity reaches is equal to the temperature of the molten metal and in certain areas where the velocity of the molten metal is high it exceeds the temperature of the incoming molten metal. This fact was not known by Frommer.

Also demonstrated by E. Mickel is the fact that the transition in die surface temperature from approximately 572° F. to approximately 1112° F. to 1310° F. is extremely rapid, being in the order of 0.001 sec. (see fig. 2.) The stress to which the die surface is subjected is created suddenly and "acts in the nature of an impact on the material of the die." This is important for it is well known that impact stresses are capable of causing deformation fractures more readily than ordinary alternating stresses.

The temperature of the face of the die cavity falls off less rapidly than it rises. Fifteen seconds were required in Mickel's experiments before the die surface temperature fell to 572° F. after the highest temperature of 1202° F. was reached.

Not only does a steep temperature gradient formed between the surface layers and underlying layers bring about surface cracking, but so does a temperature gradient between different areas of the die surface itself. This is especially true where the casting being made combines thick and thin sections so that the metal in the thin sections cools more rapidly than that in the heavy sections and a temperature gradient is set up between the surface areas of the thick and thin sections.

Magnitude of Die Stresses

As mentioned, the material at the surface of the die cavity is raised very quickly to a high temperature and while tending to expand, is prevented from so doing by the die material farther below the surface which does not reach an equally high temperature as quickly as the die surface material and which, therefore, does not tend to expand. The surface layers are held in a state of compression by the underlying layers. The magnitude of the compression stress depends upon: (1) The temperature difference between the die surface and the die interior; (2) the coefficient of thermal expansion of the die material; (3) the modulus of elasticity of the die material; and (4) the mass of the die material.

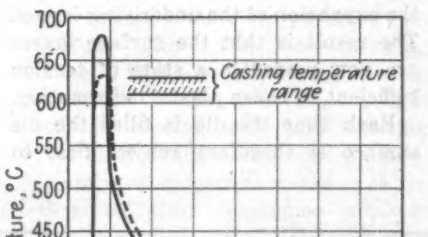

FIG. 2—Changes in temperature at points along the line 1-2-3-4-5-6 on the surface of the die. Curve I represents the temperature change of a point on the die away from the gate. Curve II represents the temperature change of a point on the die near the gate where the velocity of flow is high. (After Mickel)

The approximate magnitude of these compressive stresses is estimated by Mickel as in the order of 140 kg per sq mm (199,080 psi). This is a stress no material at a temperature of 600° C. (1112° F.) is capable of bearing without plastically deforming.

The tensile stress which follows the compression stress has a magnitude of 30 kg per sq mm (12,600 psi).

A large amount of hysteresis work is expended in this cyclic type of stressing resulting from a succession of shots. This work is available for effecting die surface fracture.

Die steels, unlike certain other materials, are incapable of absorbing appreciable hysteresis work and transforming it into heat without suffering damage, that is, the damping capacity of die steels is small.

Increasing Die Life

From the foregoing discussion it is clear that the formation of die cracks is brought about by fatigue failure of the die surface. Repetition of the high stresses engenders cracking. To withstand indefinitely the stresses involved in diecasting a die material would have to have a fatigue strength at 600° C. (1112° F.) of 100 kg per sq mm (142,200 psi at 1112° F.), a strength not attainable in any die steel!

Longer die life can in a large measure be affected by a reduction of the induced thermal stresses. Mass of die material m, modulus of elasticity E, coefficient of expansion α, and the relation of the compressive stress and the factors (T_2-T_1), where T_1 = die temperature prior to die filling and T_2 = die temperature reached upon filling, is expressed roughly by

$$\delta = \frac{mE}{m-1} \cdot \alpha \cdot (T_2 - T_1)$$

From an examination of this expression it is obvious that α can only be reduced by varying the quantity (T_2-T_1) and/or coefficient of thermal expansion α; for E and m are constants for any given die.

The reduction of the coefficient of expansion of future die materials is a definite possibility. The best contemporary die steels have a high-tungsten composition; the commonly employed 10 pct tungsten steel having one of the lowest coefficients of ex-

pansion of any present accepted die steels. (see fig. 3.)

High-chromium steel alloys have lower coefficients of expansion at 1112° F. than high-tungsten alloys; however, the use of chromium steels has not as yet been perfected.

In preparing alloys for the fabrication of dies for diecasting special attention must be given to their chemical composition and heat treatment. Of particular importance is the coefficient of expansion in the temperature range of 572° F. to 1112° F.

The difference in temperature between die face prior to filling and at the time of filling is represented by (T_2-T_1). The most obvious method of reducing the magnitude of this quantity is to lower T_2 and increase T_1.

The die temperature reached upon filling (T_2) can be lowered by: (1) Increasing the thermal conductivity of the die material; (2) by lowering the casting temperature, and (3) by preventing the rapid conduction of heat from the molten metal into the die face.

The first, raising the thermal conductivity of the die material, turns out to be rather ineffective since it does not eliminate or even minimize the initial shock and rapid temperature rise, but merely promotes the conduction of heat more quickly into the die interior.

The third, preventing the heat from passing freely into the die walls turns out to be satisfactory in certain instances. The method most generally employed is that of placing an insulating die wash on the face of the die prior to shooting. Applying the coat is an added operation during casting but it is often quite effective in increasing die life for it lowers T_2.

The second, lowering the casting temperature may or may not be possible for a given production setup. Naturally if the injection temperature is far above the liquidus temperature of the alloy and the die cavity can be successfully filled with a lower injection temperature, a lower temperature should be employed. There are instances, however, when lowering the injection temperature results merely in the production of incomplete castings.

The die temperature T_1 can be increased. The only serious result from this increase in temperature is a slowing down of the rate of production. Casting has to be done less rapidly due to a lessening of the rate of solidification.

However, slower production and increased die life is often superior to speedy production and decreased die life.

Die cracking occurs most widely in those areas on the die's surface which are most drastically cooled.

The development of die steels with higher fatigue strengths will materially increase die life and make possible the production of larger numbers from a single die cast from high melting alloys.

The fatigue strength seems to be improved by highly polishing the surface of the cavity surface prior to and during use.

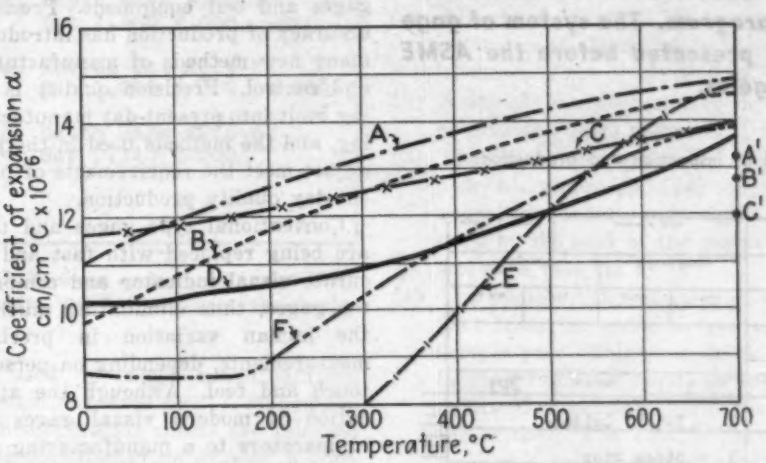

FIG. 3—Coefficients of expansion of some die materials. The best die steels now in use have a high tungsten composition, the commonly employed 10 pct tungsten steel having one of the lowest coefficients of expansion of any currently accepted die steels. A = pure iron; B = 0.8 pct carbon steel; C = 5 pct tungsten steel; D = 10 pct tungsten steel; E=Invar steel; F=cast iron; A'=25 pct tungsten steel; B'=10 pct chromium steel; C' = 25 pct chromium steel.

Conclusions

(1) The familiar thermal cracking, die surface checking or die surface cracking is caused by fatigue failure of the die material at the surface of the die cavity where molten metal contacts the die during and after filling.

(2) The fatigue failure of the die surface results from the repetition of a compression-tensile stress cycle which occurs each time a shot is made.

(3) The compression-tensile stress cycle results from the inhibited expansion and contraction of the die face with temperature variation.

(4) Factors affecting the magnitude of the stresses are die temperature, die material, injection temperature, casting rate and uniformity of cooling of the die.

(5) Low casting temperatures and high die temperatures promote longer die life.

(6) Polished die faces tend to ward off fatigue failure.

(7) A good die material should have:

a—Low coefficient of thermal expansion

b—High fatigue strength

c—High damping capacity

d—Low susceptibility to erosion and surface damage under alternating loads

(8) The employment of a die coat of low thermal conductivity aids in certain instances in increasing die life.

(9) Constant die temperature is preferable to a variable die temperature as results from drastic water cooling of the die after filling.

▼ ▼ ▼

Gage Control

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. . . Gages can never be more precise than the system by which their accuracy is controlled. The selection, maintenance, care and control of gages and tools therefore becomes of the utmost importance in any production of quality program. The system of gage and tool control described herein was presented before the ASME in Los Angeles.

THE inspection system should insist upon the adoption and use of property designed standard gages and test equipment. Precision accuracy of production has introduced many new methods of manufacturing and control. Precision quality is being built into present-day manufacturing, and the methods used in the past do not meet the requirements of present-day quality production.

Conventional type gages and tools are being replaced with fast and accurate visual indicator and comparator gages, thus eliminating much of the human variation in precision measurements, depending on personal touch and feel. Although the application of modern visual gages and comparators to a manufacturing system will increase the flow of quality parts through the shop, newly developed methods should be controlled in a manner that will insure a continued future flow of quality production.

Permanent records of all improved applications of special indicator and comparator gages should be kept in order to assure the shop that quality production standards will improve with each newly specified process and method for inspection and production. This control can be accomplished in conjunction with the manufacturing outlines or operation sheets that

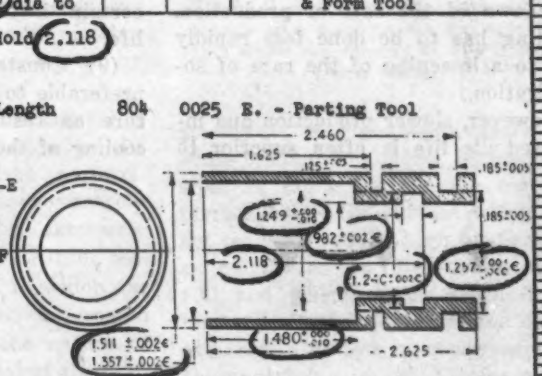
FIG. 1—The operation sheet fosters control of inspection and production.

SBD

Sheet of 1 of 4	Part Number 1199643	OPERATION SHEET			Part Number	Mach.	Booth
Oper. 3	Part Name: Adapter - Arrest. Hook Strut Assem.				Order Number	Serial	
	Material: 1-5/8" Dia 24 St. Alum Alloy Bar				Qty. / Split / Due / Bin No.		
Change NC	Machine: #5 Gisholt Turret Lathe		Std.	Set Up			
Edition 2	Operation	Per Plane 1	Speed	Feed	Oper. 3	Tools	Heat No. 203
1. Machine as follows -					X. - 1-5/8" Collet		
2. Index Stock -					1. - Stock Stop		
3. Face -			804	0075	A. - Facing Tool -		
4. Turn O.D. 1.511 +.000 -.002 dia -			804	0075	B. - Turning Tool		
5. Center Drill to 3/8 dia-			804	Hand	1. - F-2 Center Drill		
6. Position Live Center -					2. - Live Center		
7. Form .125 +.000 -.003 groove to 1.249 +.015 -.010 dia to incl. .005R			138	Hand	C. - Form Tool		
8. Form .185 +.000 -.005 groove to 1.257 +.003 -.000 dia to incl. 1/32R			138	Hand	D. - Form Tool		
9. Drill 15/16" dia thru -			804	0075	3. - 15/16" Drill		
10. Finish Bore Small I.D. .982 +.002 -.002 dia			804	0075	4. - Slide Head Boring Bar		
11. Rough & Finish Bore large I. D. 1.357 +.002 to 1.480 +.000 -.010 depth - Incl. .032 (Min) R			804	0075	5. - Slide Head Boring Bar		
12. Form I.D. groove .185 +.000 -.005 wide to 1.240 +.002 -.002 dia to incl. .032 R & to Hold 2.118 dim.			138	Hand	6. - Slide Head Boring Bar & Form Tool		
13. Part off to 2.625 Length			804	0025	E. - Parting Tool		

GAGES REQUIRED

Fed. Adj. Snap #219-BB
Fed. Outside Cal. #215-E
Fed. Hole Gage #210-B
Fed. Blind Hole #218-B
Fed. Depth Gage #216-A
Fed. Inside Cal. #215-F
Fed. Depth Gage #216-A



℄ = CONCENTRIC WITHIN .001 FULL IND. READING

Time Standards	Manufacturing	Tooling	Inspection
G.W.Sanford 9-18-44	B.South	Godward 1-5-44	J.W. Moore

Thread Plug Gage Wear Tolerance Code

(Applied to Go Members Only)

Class	From	To and Including	
Class 0	−0.0001	±0.0000	For reference only
Class 1	±0.0000	+0.0001	For inspection
Class 2	+0.0001	+0.0002	For production
Class 3	+0.0002	+0.0003	For production

NOTE: No provisions are made for class 3 thread plug gage tolerances for wear in the ASA of screw thread standards. Any allowances for wear on thread plug gages is left to the individual manufacturers to comply with their quality standards.

PART NUMBER 1199643	SHIP SBD
PART NAME Adapter - Arrest Hook Strut	

Fed. Adj Snap #219-BB
Set 1.511 ∓ 002

Fed. Outside Cal. #215-E
For Dimensions
1.249 ∓ 000, - 010
1.257 ∓ 003, - 000

Fed. Blind Hole Gage #218-B
Set .982 ∓ 002

Fed. Hole Gage #210-B
Set 1.357 ∓ 002

Fed. Depth Gage #216-A
Set 1.480 ∓ 000, -010

Fed. Inside Cal #215-F
Set 1.240 ∓ 002, - 000

Fed. Depth Gage #216-A
Set 2.118 ∓ 002

FIG. 2—Gage control card contains all gages specified on operations sheet.

are used in most manufacturing organizations, (see fig. 1). When the advance operation sheets are released to the manufacturing system, a copy should be sent to the gage control department and the following steps taken:

(1) Specify gages to all dimensions on the operation sheets that require precision measurements.

(2) Make a gage control card containing all gages specified on the Operation sheet (see fig. 2).

(3) Send specified information on operation sheet to master file and have information added to master operation sheet.

(4) File operation sheets and gage control cards by part number.

The gage control should be notified of all jobs dispatched to the shop by a job dispatch card (see fig. 3) and the following steps taken:

(1) All gages specified on the gage control card should be set up for issuance to the shop (see fig. 2).

(2) A setting tolerance sticker should be attached to all gages.

(3) The machine operator should pick up gages specified on the operation sheet and sign for them on the back of the gage control card (see fig. 4).

(4) The operator should split off one part from the order to use as a sample part. This part should be labeled "sample" and measurements of dimensions indicated on the sticker. The sample part is used as a reference check for the setting of the gage. If the gage becomes out of adjustment, it should be returned to the gage department and readjusted.

TOOLS DRAWN	YES	NO	NEXT UP	YES	NO
DETR PRINTS	YES	NO	IN WORK	YES	NO
STATU					
SHEET OF 1of4	PART NUMBER 1199643				
OPER. 3	Adapter--Arrest, Hook Str 1-5/8" dia. 24 ST Alum.Al				
CHANGE NC	#5 Gisholt Turret Lathe				
EDITION 2	ESX 157-B			PER PLAN 1	

FIG. 3—This job dispatch card notifies gage control of jobs dispatched to the shop.

(5) Gages should be returned to the gage department at the end of each shift, checked for setting and compared against the sample part before reissuance.

(6) When job is completed, the sample part should be sent through with the rest of the order.

(7) Upon completion of the job, the operator should sign out the job in the space provided on the reverse side of the gage control card and the gages put back in reserve to be reset.

Additional gages or special methods of inspection should be added to the

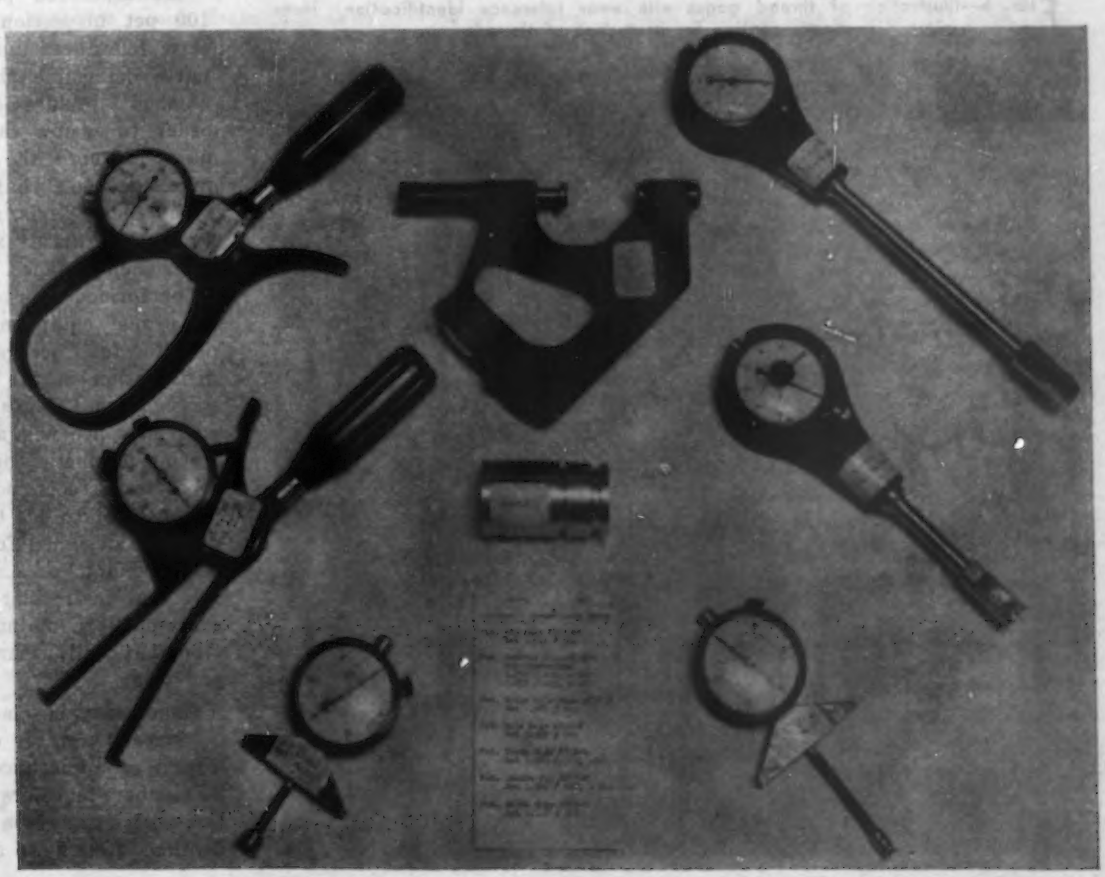


FIG. 4—A set of gages listed on a gage control card. This is signed on the reverse side by the machine operator for any gages picked up.

FIG. 5—Centrally located gage inspection room has specially designed fixtures and cabinets to store precision gages and tools.

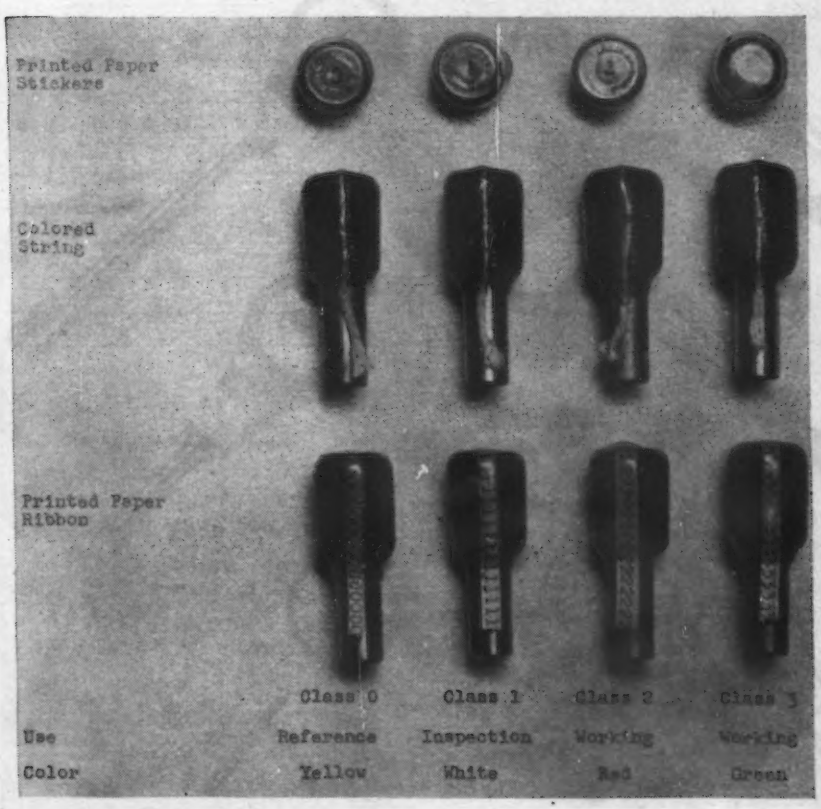
operation sheets, master operation sheets, and gage control cards. By rigid control of indicator and comparator gages, the shop is assured that all jobs will operate under the best condtions possible, and all new developments of processes or inspection methods will become a matter of permanent record.

Control charts will show that scrap will be materially reduced in the machine shop that uses modern visual indicator and comparator gages together with operational line inspection and statistical quality control.

Gage Control Location

It is desirable and economical to have all gages and precision tools located centrally in the shop where absolute control for wear and distribution can be maintained. With this arrangement, many control features in organization may be developed requiring a minimum of effort and time. The centrally located gage inspection and control location should have specially designed cabinets and fixtures to store precision gages and tools, with temperature control if possible. (See fig. 5.) Cabinets of similar design allow precision gages and tools to be stored in dust-free and protected cabinets. Congestion at shift changes is eliminated as the arrangement and accessibility of cabinets provides for fast distribution.

FIG. 6—Illustration of thread gages with wear tolerance identification. Note plastic coating for protection of threads.



Manufactured parts that require 100 pct inspection are designed to close tolerances and these individual parts determine the quality of the finished product or assembly. In order to assure the flow of quality parts through the shop, gages and precision tools that are used to inspect these parts require inspection by standardized accepted methods after each issuance. This control may be performed with a minimum of help as proper equipment is made available for fast, accurate inspection and distribution in the centrally located gage room. Gages inspected after each issuance will assist the shop in solving production problems that arise from worn tools, poor alignment, or the attempt to use tools that are not properly designed for the job or material being used. As gages are expensive and their tolerances close, it is economical to maintain a rigid control that will assure longer service and wear.

Gages may be classified as to size by inspection after each issuance by a wear code tolerance. This code may be numbers or colors used in conjunction with a gage wear tolerance specification. (See fig. 6 and table.) After

ESX197 (REV. 7-44) PRECISION GAUGE INSPECTION RECORD

Serial No.	Class & Style	Loc.	Price (Inv)	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July
M	NF3	INSP. #2	$18.00	8-8-44 +.0001 ±.0000	9-20-44 O.K.	10-14-44 O.K.	11-16-44 O.K.	12-16-44 O.K.	1-12-45 O.K.	2-22-45 -.0001 -.00025					
L	NF3	INSP. #2	$18.00	8-8-44 +.00015 -.0002	9-20-44 O.K.	10-14-44 O.K.	11-16-44 O.K.	12-16-44 +.2315 +.0001	1-13-45 ±.0000 +.00025	2-18-45 O.K.					
K	NF3	INSP. #1	$18.00	8-8-44 +.0002 -.0001	9-18-44 +.0002 -.0003	10-13-44 +.0001 +.0001	11-15-44 +.00015 +.00025	12-15-44 +.00005 +.0000	1-13-44 ±.0000 -.00025	2-21-45 -.00005 -.0001					
J	NF3	INSP. #2	$18.00	8-8-44 +.0003 -.0001	9-20-44 O.K.	10-14-44 +.0002 -.00015	11-16-44 +.0002 -.00015	12-16-44 +.00015 -.00015	1-13-45 +.00015 -.0002	2-22-45 +.00015 -.0002					
I	NF3	B²	$18.00	8-7-44 +.00015 -.0001	9-2-44 +.0001 -.0001	10-12-44 +.00005 -.00015	11-30-44 ±.0000 -.00025	12-18-44 -.0000 -.00025	1-31-45 +.0001 -.0002	2-28-45 -.00015 +.0002					
H	NF3	2-D-11	$18.00	8-2-44 +.0003 ±.0000	9-5-44 +.00025 ±.0000	10-5-44 +.0002 ±.0000	11-14-44 +.00015 ±.0001	12-14-44 -.00005 -.0001	1-11-45 -.00015 -.00015	2-20-45 +.0001 -.00015					
G	NF3	1-D-12	$18.00	8-2-44 +.0001 -.00005	9-25-44 O.K.	10-9-44 O.K.	11-16-44 O.K.	12-16-44 O.K.	1-11-45 O.K.	2-17-45 O.K.					
F	NF3	2-C-10	$18.00	8-1-44 ±.0000 +.0001	9-6-44 O.K.	10-10-44 -.00005 -.00015	10-13-44 -.00005 -.0002	12-12-44 O.K.	1-8-45 -.00005 -.00025	2-18-45 O.K.					
E	NF3	1-D-12	$18.00	8-7-44 +.0002 ±.0000	9-25-44 O.K.	10-9-44 O.K.	11-16-44 O.K.	12-16-44 O.K.	1-11-45 O.K.	2-18-45 O.K.					
D	NF3	2-C-10	$18.00	8-1-44 +.0001 -.0001	9-6-44 O.K.	10-10-44 +.0001 -.0002	11-13-44 ±.0000 +.0001	12-12-44 -.00015 -.00005	1-8-45 -.00015 -.0001	2-14-45 O.K.					
C	NF3	2-C-10	$18.00	8-11-44 -.0002 -.0001	9-6-44 O.K.	10-10-44 O.O.S. -.0002	11-13-44 O.O.S. -.0002	12-14-44 O.O.S. -.0002	1-8-45 -.0001 -.0001	2-14-45 +.0001 +.0001					
B	NF3	2-D-11	$18.00	8-2-44 -.0002 +.00005	9-5-44 +.0002 ±.0001	10-11-44 +.0001 -.0001	11-14-44 ±.0000 ±.0000	12-14-44 -.0001 -.0001	1-11-45 -.0002 -.00015	2-19-45 +.0003 -.0002					
A	NF3	2-D-11	$18.00	8-2-44 -.0001 -.0002	9-5-44 O.K.	10-11-44 -.0001 -.0003	11-14-44 -.0002 +.0001	12-13-44 O.K.	1-11-45 +.0003 ±.0000	2-14-45 O.K.					

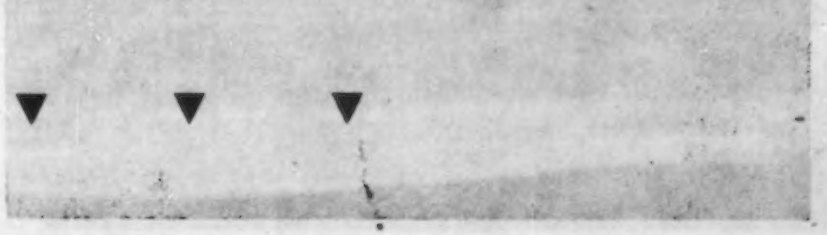
(8) 5/8-24 NF3 THREAD PLUG GAUGE Go P.D. .3479 O.W. .38400 No Go P.D. .3503 O.W. .38640 (9) Wire Size=.02406 O.W.= P.D.-.03610

FIG. 7—Precision gage inspection record. Encircled numbers indicate the following: (1) Size, class and type of gage; (2) pitch diameter of go no-go gage and over wire size; (3) wire size and over wire formula; (4) serial number of gage; (5) class and style of gage; (6) location of gage; (7) price of gage for inventory purposes; (8) spaces to record each months' inspection; (9) go and no-go inspection size; (10) "O. K." indicates gage has not been used since last inspection; (11) "O. O. S." indicates gages are out of service; 12) and (13) indicates replacement of go and no-go inserts respectively; and (14) "O. P." indicates gage on outside production.

the gages have been inspected and classified for size, they may be dipped with a protective plastic coating and stored in the cabinets for reissuance, and since all gages are classified for size, production and inspection gages may be drawn from the same source. Gages issued to production departments should be of class 3 and 2, while those for inspection should be of class 1 and 0. Gages of class 0 should be used for reference gages, solely for the purpose of salvage dispositions of manufactured parts. As production gages of classes 3 and 2 wear to the limits of classes 1 and 0, they become inspection or reference gages (see table). All gages furnished to the outside manufacturing subcontractors should be of class 3 only, thereby assuring acceptable parts to the prime contractors by source or receiving inspection.

The visual system of gage records is the most desirable and economical for the control of gages since forms of proper arrangement furnish complete, fast and accurate information. Fig. 7 contains other information valuable to a rigid control system. Due to the price of gages it is easy to become overstocked and carry an unnecessary capital investment. Gages marked "O.K." in fig. 7 indicate that they have not been used during the month. The exact locations of gages are available and redistribution to other locations may be determined from the records. Replacements may be ordered from the quantities used during the month.

Good control of quality and methods of manufacturing reflect good management, and quality must be built into production by rigid control of tooling and methods. By rigid control of gages and tools, statistical methods for quality control may be more easily and accurately adopted to illustrate the progress of quality throughout the shop.



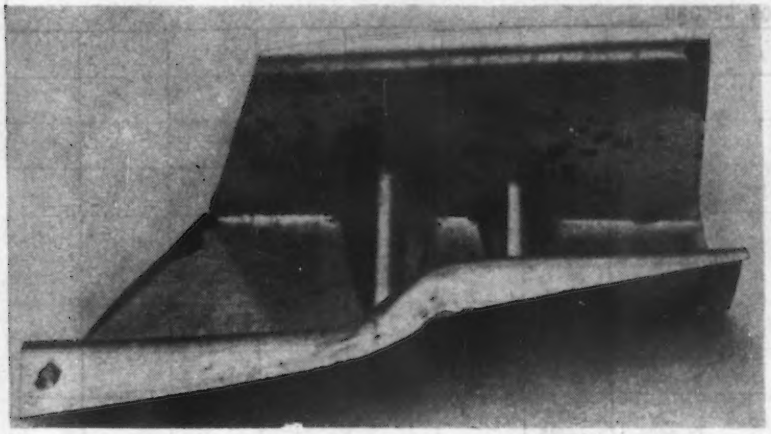


FIG. 1—Corrosion of 24S-T Alclad aluminum alloy sheet formed on low-melting alloy drop hammer dies.

Corrosion of Aluminum by

FOR several years, many sheet metal parts, particularly for prototype aircraft, have been formed by drop hammer, employing low-melting alloy dies. Alloys found to be most satisfactory for purposes of producing a few prototype parts rapidly and to accurate dimensions have been of the bismuth-lead-tin-cadmium type similar to Cerrobend, Woods metal, etc.

These alloys have gained popularity in the aircraft industry by offering the two distinct advantages of low handling temperatures (melting point 160° F) and freedom from shrinkage upon cooling.

With the increase in application of low-melting alloys to new and more complex die shapes, several problems having to do with growth characteristics and corrosion potentialities of the material have arisen. It is believed that observations made at Lockheed Aircraft Corp. on the corrosion of Alclad aluminum-alloy parts formed on Cerrobend drop hammer dies may be enlightening to others who may encounter this particular problem.

The presence of a spotty type of corrosive attack was first noted on Alclad aluminum-alloy (24S) sheet metal parts rather severely formed by drop hammer, and subsequently heat treated in air furnaces. Typical appearance of corroded parts is shown in figs. 1 and 2. In an effort to trace the cause of the corrosion, which appeared immediately after heat treatment, an examination of air furnaces and spray quench was made. When this study failed to show any variation from normal operation or conditions of treatment, sheet materials were investigated for possibilities that the corrosion might be ascribed to deficient material. It was found that attack was not limited to sheet produced by one manufacturer but further, had even occurred on some parts formed by hydropress over masonite form blocks. A survey and analysis of forming operations finally resulted in several observations which ultimately led to the origin of the corrosive attack.

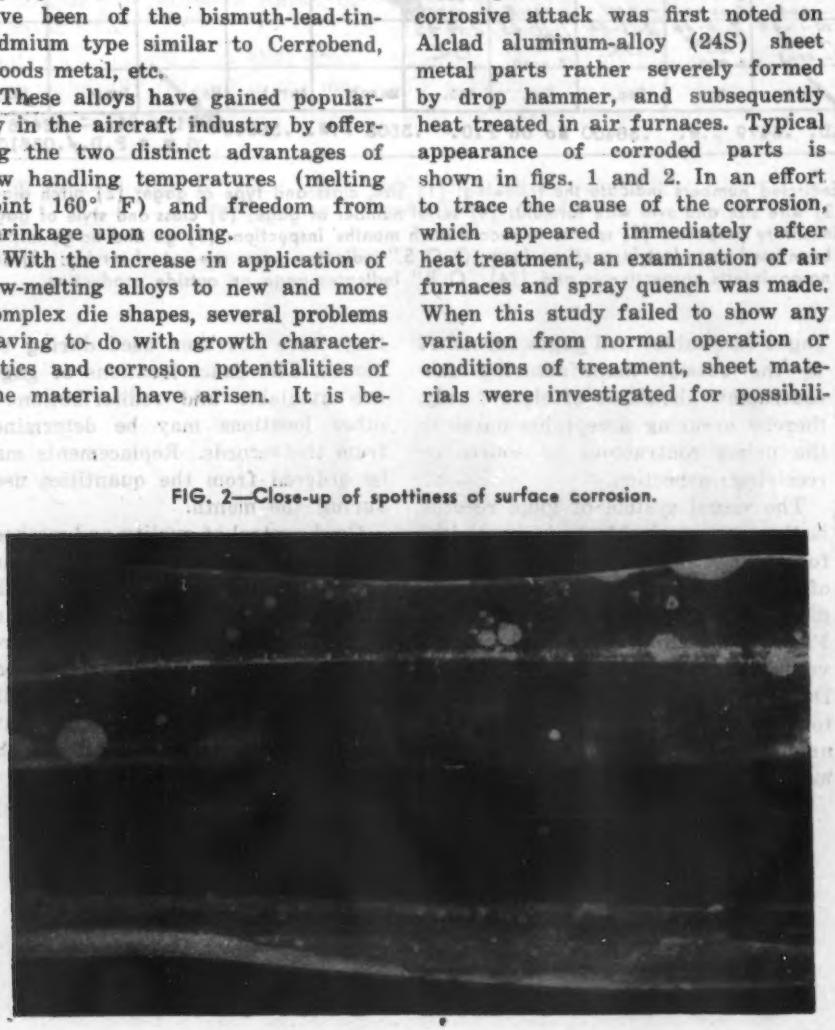
When corrosion occurred in parts formed on masonite dies, it was found that fine grindings from nearby Cerrobend dies had settled on the masonite form blocks. In no case did corrosion occur in parts formed on Kirksite drop hammer dies.

Careful inspection of test parts after anodizing and forming on Cerrobend dies indicated that attack was initiated during forming operations and that corrosion was merely aggravated by heat treatment.

The first appreciable corrosion was noted at a time shortly after the use of an old-type drawing lubricant had been discontinued in favor of "more efficient" new-type water soluble drawing compounds. Subsequently it was found that during drop hammer forming the small particles of Cerrobend became embedded in the soft matrix of Alcladding on sheet parts. These were not removed by the degreasing operation following forming, and during heat treatment the particles melted, diffused and caused corrosive attack. The extent of corrosive penetration in heavily attacked areas is illustrated in the micrograph of fig. 3, wherein it is apparent that corrosion is limited essentially to partial attack of Alclad layers.

Inasmuch as occurrence of this cor-

FIG. 2—Close-up of spottiness of surface corrosion.



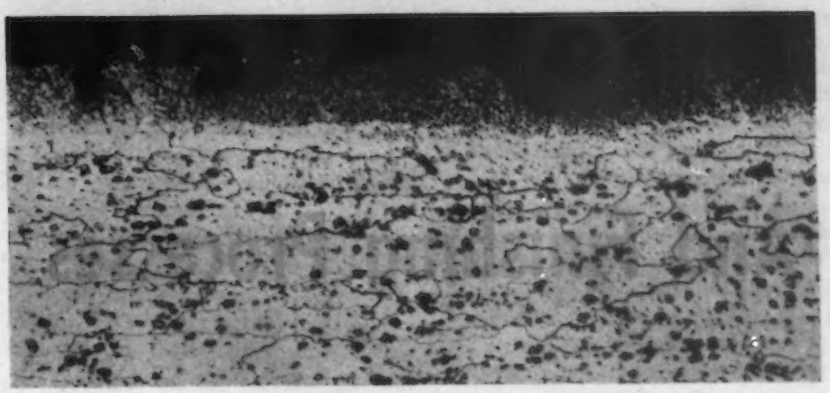


FIG. 3 — Photomicrograph at 200X showing sectional aspects of corrosion in Alclad layer.

Die Materials

By P. A. HAYTHORNE

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. . . This investigation is concerned with the corrosion of Alclad 24S sheet metal parts formed on low-melting alloy dies. The application of a heavy-bodied lubricant to both dies and Alclad sheet goes far in preventing the embedding of corrosive particles.

rosion had not previously been reported, a complete investigation of all plant procedures used in connection with handling, melting and casting of Cerrobend dies was conducted in an effort to trace any contamination of the alloy which might reasonably render it corrosive to aluminum at elevated temperatures of heat treatment. This investigation yielded negative results in that no discrepancies in handling of the material were noted and no evidence of specific contamination corrodent was discovered in the alloy.

Before extensive investigation was undertaken to solve the corrosion problem, it was essential that immediate steps be taken to prevent further damage to production parts currently being formed and heat treated. A suitable procedure was developed which effectively removed all deposited die particles before heat treatment. The method consisted of dipping formed parts in a nitric acid solution (25 pct by volume) at room temperature immediately after degreasing. The acid dip was followed by thorough rinsing, and corrosion was completely eliminated.

Tests were conducted to evaluate the effects of various drawing compounds and die lubricants in preventing the lodging of corrosive particles in sheet surfaces. These tests involved the forming of well lubricated sheets on dies also generously applied with the different compounds. Results of laboratory tests may be summarized as follows:

(1) Corrosion of parts appeared during heat treatment when sufficient abrasion and embedding of die particles occurred during previous forming operations.

(2) The amount of corrosive attack appeared independent of the several Bi-Pb-Sn-Cd type die alloys used for testing.

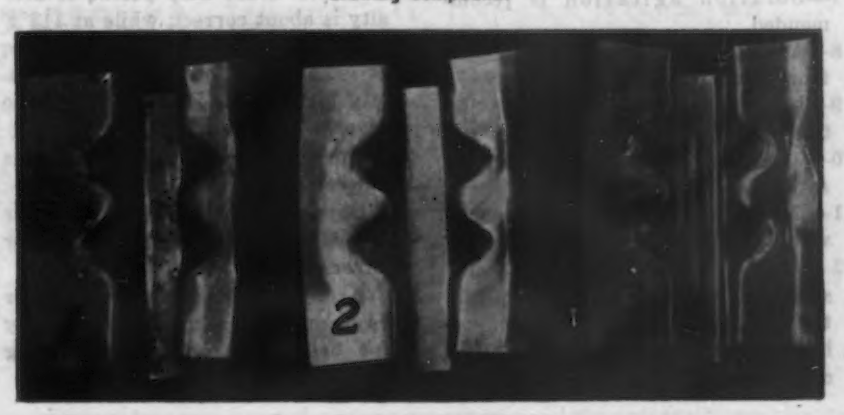
(3) Heat-treated (24S-T) sheet material showed a substantially more severe and extensive attack than annealed sheet (24S-O), probably the result of increased abrasion during forming of the harder material.

(4) In all cases parts formed on properly cleared and dressed dies showed considerably less corrosion than those formed on rough dies or dies impregnated with fine particles.

(5) It was found that generally a heavy-body lubricant applied copiously to both dies and Alclad sheet will in large part prevent the embedding of corrosive particles. Severely formed 24S-T parts show varying amounts of attack as a result of using different die lubricants, fig. 4.

(6) The use of a nitric acid dip (25 pct solution) followed by thorough rinsing after degreasing but before heat treatment is recommended as the greatest assurance that no attack will occur in subsequent operations. In the event that restriking of parts distorted in heat treatment is necessary, it is important that the acid dip be employed to preclude corrosive attack during storage and during service of the aircraft.

FIG. 4—24S-T Alclad sheet metal parts formed on (1) dry, undressed dies, (2) dies coated with light lubricant, and (3) dies lubricated with heavy-bodied drawing compound.



Metals, Finishes, And Finishing Processes

By EDWARD ENGEL

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IN THIS third section of a four-part article, considerably more hitherto widely scattered data are correlated to aid in the selection of the proper metal, finish, and finishing process. In the preceding two parts of this article, attention was devoted to spot tests for identification, porosity tests for electrodeposits, comparison of pickling-degreasing cleaning procedures, electrolytic and acid pickling, removal of oils, various cleaning operations, electropolishing, and the selection of surface finishes for functional and decorative purposes. Herein, data are given on proprietary plating baths, surface treatment of aluminum and magnesium alloys, etching procedures, dye coloring, etc.

KEY TO TABLE XXI

1—Decrease the current density.

2—Increase the current density.

3—Decrease the temperature of the bath.

4—Increase the temperature of the bath.

5—Continuous filtration is recommended. (Decreases throwing power slightly.)

6—Settle and decant the impurities.

7—Solution agitation is recommended.

8—A better throwing power results from a still bath.

9—Increase the anode-to-cathode distance.

10—Regulate the anode-to-cathode ratio.

11—Remove the anodes from the bath when *not* in operation.

12—Decrease the hydrogen occlusions and subsequent metal embrittlement either by operation at higher temperatures when other conditions permit, or by baking the plated metal at about 350°F to 400°F for 1 hr to 4 hr. Deposited silver is the most difficult to relieve of hydrogen occlusions; chromium has the greatest amount, lead the least, while tin is the easiest to relieve; cadmium has a negligible amount, while zinc has considerable. Baking in air is more efficient in hydrogen relief than an immersion in hot oil.

13—Correct racking is very important.

14—Conforming anodes and insulated baffle plates are requirements in much of this type of plating.

15—Polish the base metal prior to plating.

16—Bag the anodes.

17—Agitate the cathodes (work), and if the throwing power is lost counterbalance by using a more concentrated electrolyte or a higher current density or increase the conducting salt contents.

18—The temperature control is delicate.

19—Exact control of temperature and current density are requirements:
In the chromium bath, for instance, at 122°F a 200 amp per sq ft density is about correct, while at 113°F a current density of 100 amp per sq ft is correct. Too low current density gives matte and too high also gives a matte finish.

20—Operation at correct pH range is a necessity.

21—Copper, tin or nickel in the order named is the best undercoat for silver plate.

22—At least a flash coat of copper from an alkaline bath is necessary for best results prior to entering the acid copper bath.

23—A high sulphate nickel bath, or one of the proprietary nickel baths similar to the Zialite, or the one offered for this purpose by General Motors is required if a zinc die-casting is to be plated directly with nickel.

24—Add (325 mesh) zinc dust, 1 lb per 100 gal of electrolyte, or cadmium sponge, and stir for about 1 hr or more and filter to remove metallic impurities; or electrolyze at a low current density (2 to 3 amp per sq ft) at room temperature and filter.

25—Precipitate iron from nickel baths with iron filings or iron hydroxide at a pH of 5.5; or add sodium sulfide or sodium thiosulfide.

26—Remove metallic impurities, e.g. copper, lead, cadmium, iron, zinc, aluminum, chromium, etc. from hard nickel and chloride nickel baths as follows:
a—remove anodes from bath or use a separate bath.
b—raise the temperature of the bath to about 140°F.
c—add nickel carbonate slurry and stir until pH is about 5.6 to 5.8
d—stir in 2 to 4 lb of lime per 100 gal of electrolyte until pH is about 6.0 to 6.2.
e—add hydrogen peroxide, ½ lb per 100 gal of electrolyte, stir and filter through activated carbon.

27—Remove tin from brass baths with a solution of calcium chloride, stir and filter.

28—Remove organics by filtering, or add hydrogen peroxide, stir and filter through activated carbon or diatomaceous earth, etc. In bright-nickel baths this method cannot be used unless the baths can be replenished with the brighteners.

29—Use mechanical agitation *not* air agitation.

30—Reduce hex-valent to tri-valent chromium by electrolyzing at very low current density (2 to 3 amp per sq ft) and use a much smaller cathode than anode.

31—Increase the dextrin content.

32—Decrease the caustic soda, acetate and hydrogen peroxide contents to avoid sponginess.

33—Increase the caustic soda contents.

34—Lower the pH.

35—Raise the pH in nickel baths; boric acid is used as a buffer to assist in maintaining pH.

36—Reduce the cyanide contents; excessive cyanide causes blisters in cyanide plating baths. Excessive cyanide may be indicated by undue gassing and little deposition, and may be corrected by adding metal carbonate.

37—Increase the cyanide contents. Add 5 lb of cyanide per 1000 sq ft of plated work in brass bath.

38—Reduce the metal contents; in the silver bath do not use over 33 g per liter of silver.

39—Increase the metal contents.

40—Decrease the carbonate contents, excessive carbonate is precipitated out of copper and cadmium cyanide and other cyanide baths with calcium sulphate or by freezing; 1.6 times as much calcium sulphate is added as carbonate to be precipitated. Add the sulphate and stir and filter. In freezing use a steel container, holding 35 gal of naphtha and 1400 lb of dry ice.

41—Increase the carbonate contents.

42—Multi-edge anodes of lead tend to give improved conductivity in chromium baths.

43—High sulphate ratio in chromium baths narrows the bright range and decreases the coverage.

44—Decrease the brightener contents.

45—Increase the brightener contents.

46—Requires silver strike deposit prior to entering a standard electrolyte.

47—Decrease the hydrogen peroxide contents.

48—Add hydrogen peroxide.

49—Reduce the amount of conducting salts.

50—Increase the amount of conducting salts.

51—To reactivate a nickel deposit after the chromium plate has been stripped use an 18 pct HC1 acid immersion and clean in reverse current in the chromium plating bath before plating.

52—Increase the buffer agent content.

53—Use less than 33 g per liter of silver bath to avoid smutty deposits, or if a high silver content exists along with high current density a burnt deposit will occur.

54—Bath should be kept full of work, or dummy cathodes should be used and then utilized as anodes as they become covered with metal.

55—Add glue to increase the throwing power and to brighten the deposit in the Rochelle bath.

56—Decrease the glue contents.

57—Use potassium salts in place of sodium salts.

58—Use more wetting agent.

59—Operate with pure salts.

60—Thorough cleaning is imperative.

61—Iron compounds are very difficult to remove from Rochelle copper baths, so use a minimum amount of carbonate.

62—In low pH nickel baths use a range of 1.5 to 3.0 pH, and for high pH baths do not operate in any range but 3.6 to 4.5. Low pH baths present smooth deposits at high current densities, while the high pH baths give rough deposits when

TABLE XXI

KEY NUMBERS TO DATA ON REGULATION OF BATH FOR QUALITY CONTROL OF DEPOSITS

Type of Plating Bath	TO PREVENT						TO IMPROVE		
	Pitting	Embrittlement and Excessive Hardness	Roughness and Excessive Porosity	Discoloration of Deposits (or of Anodes)	Poor Adhesion	Treeing	Throwing Power	Rate of Deposition	Brightness
Brass	60		27,28,49,63	4,37,65, 67,63	35,60	1	2,3,9,27,37,50, 77	2,4,35,50	63,65
Cadmium	33,60,66		24,40,46,49,77	1,24	31,60,66	1,4	2,3,9,9,39,50, 66,77	2,4,34,50	2,31
Chromium		1,4,12,19	13,14,19	12,14,19	14,19,51,60	1,4,14	2,3,10,13,14, 43,70	2,4,14,19, 42-30	19,43,70
Copper (cyanide)	24,60,66	1,4,66	1,3,30,37,38,40, 49,77	1,36 or 37, 60,64	36,60,66	1,4,50	2,3,9,24,28,39, 50,55,77	2,4,35,50	41,45
Copper (rochelle)	5,7,24,28, 61	1,4,66	1,5,30,36,38,40, 58,49,77	1,36 or 37, 56,61,54	1,60	1,4,50	2,3,7,9,24,28, 39,50,55,77	2,4,7,50	7,45,55
Copper (acid)	5,7	1,4,5,7,31,50	1,5,34,74,77	1,4,5,56	29,22,31	1,4,50	3,9,34,39,77	4,31,50	34
Gold	1,60	1,60	1,13,59,60,77	59,72	1,60	50	3,9,13,39,50,77	4,50,59,71	59,60,72
Nickel (hard)	48,58,71	1,4,12,16,25, 28,34	5,16,25,26,28,29, 38,62,71,77	25,26	9,15,20,23,25, 35,51,60,71,73	1,4,5, 50	1,9,28,34,39,50, 52,71,77	2,4,5,17,25, 50,71	28,71
Nickel (all chloride)	48,58,71	1,4,12,16,25, 28,34	1,4,5,16,25,26,28, 29,38,49,62,71,77	1,4,25, 39,62	1,15,20,23, 25,35,51,60	1,4,5, 50	1,9,28,34,39, 50,52,77	2,4,5,17, 25,50,71	28,7,71
Nickel (sulphate)	16,24,25, 28,48,58, 71,76	1,4,12,16,25, 28,34,47,70, 71	1,5,16,25,26,28, 29,34,38,49,58, 62,70,76,77	1,4,25, 39,62,71	1,15,20,23, 35,57,60,76	1,4,5, 50	1,5,9,29,34, 39,47,50,52,77	2,4,5,17, 34,39,50, 71	7,45,70,76
Nickel (Watts) and (bright types)	25,26,28, 48,58,71	1,4,12,16,25, 28,34,47,71, 78	1,5,16,24,25,26, 28,29,38,49,58, 62,71,77	1,4,62,71	1,15,20,23, 35,51,60,71	1,4,5,7, 34,50	1,25,28,34,39, 47,50,52,77	2,4,5,17,25, 50,71	45,71,78
Silver	4,38,44	4,12	1,5,16,28,38,41, 44,49,57,59,77	40,53,57, 59	5,21,35,45, 60,75	50	2,3,9,37,39, 41,57,77	2,4,17,37, 39,50	2,3,16,17, 37,45,53, 57,75
Tin (stannate)	3,6,10	3,6,10,11,24, 40,60	6,11,28,32,54, 59,77	3,11,54	2,29,54,60	50,54,69	1,3,33,39,41, 50,54,77	2,4,5,50,54	11,54
Zinc (cyanide)	24,66	11,12,24,60	11,24,38,49,77	64,66	66	50,54	2,3,9,9,18,24, 29,37,33,50, 54,77	2,4,18,53	24,45

operated at high current densities.

63—Remove excess carbonates from brass baths with barium cyanide, stir, filter, or freeze and filter.

64—A film on the anode indicates a need for increased cyanide contents. (1) If a steel-gray deposit occurs it indicates arsenic; remove by using a copper cathode and plate out. (2) A black film on the anode which persists when the current is off may be lead in the bath, which may be electrolyzed out at low current densities. (3) Tin is indicated by a dark film on the anode which disappears when the current is off; this may be removed by electrolyzing at low current densities, or by precipitating out with calcium chloride, stirring and filtering. Loose dark films, cupric oxide, offers no harm.

65—Add alum, 1 to 1½ oz per gal of electrolyte, as a brightener to brass baths.

66—Add 1/64 oz (per 100 gal) of sodium hydrosulfide, or electrolyze to remove chromium from copper, cadmium and other cyanide baths, and filter.

67—Remove excess zinc (also bronze) with sodium sulfide, stir and filter.

68—Close temperature control of brass baths and proper composition of anodes are required to control the color of the deposit. Increase the pH to increase the ratio of zinc deposited. Add sodium carbonate to decrease the ratio of zinc deposited. (Ammonium hydroxide is added to increase the ratio of zinc deposited).

69—If a tray of iron or nickel gauze is immersed during cooling of the bath, an excess of carbonate can be removed from the tin stannate bath.

70—Remove an excess of sulphate from the nickel sulphate bath by precipitating with freshly precipitated barium hydroxide, stir and filter. The same procedure is used for removing excess H_2SO_4 from chromium plating baths; use 3.13 oz of salt per oz of acid, although an excess may be used.

71—Close pH control.

72—Control pH for color of deposit.

73—Chloride contents of hard nickel baths to be at least 1.8 oz per gal to obtain good adhesion. Stresses in basis metal also may be cause of poor adherence.

74—Add ¼ lb of potassium permanganate per 100 gal of electrolyte, heat and filter in order to precipitate organics from the acid copper bath.

TABLE XXII

SURFACE TREATMENTS OF ALUMINUM ALLOYS

Treatment	Purpose	Limitations and Merits	Proprietary	Operation	Thickness and 20 Pct Salt Spray Resistance
ALROK** Army Air Force 98-20007 Amend. No. 3	Corrosion resistance and for a paint base	Best results on non heat-treatable alloys; assemblies with steel may be treated	Aluminum Co. of America	10 to 30 min immersion at 180°F to 200°F, steel tank	No dimensional change, 250 hr or more on non heat-treated alloys
CHEMOXIDING** Army Air Force 98-20007 Amend. No. 3	Corrosion resistance and for a paint base	Best results on non heat-treatable alloys; assemblies with steel may be treated	Colonial Alloys Co.	3 to 10 min immersion at 180°F to 200°F, steel tank	No dimensional change, 250 hr or more on non heat-treated alloys
ALUMILITING* Anodizing	High corrosion resistance, abrasion resistance, paint and dye base	All alloys; no assemblies with other metals; difficult to color die castings	Aluminum Co. of America	15 to 60 min, 12 amp per sq ft, 24 v dc, 70°F, 90°F, lead tank and cathode, aluminum racks	0.0002 to 0.0008-in. coat, about one-third of which is dimensional change, 250 to 1000 hr
ELECTRODIZING* Anodizing	High corrosion resistance, abrasion resistance, paint and dye base	All alloys; no assemblies with other metals; difficult to color die castings	Colonial Alloys Co.	10 to 35 min, 12 to 24 amp per sq ft, 20 to 30 v ac, 80° to 100°F; work acts as anode and cathode, insulated tank, aluminum racks	0.0002 to 0.0008-in. coat, about one-third of which is dimensional change, 250 to 1000 hr
CHROMIC ACID* Anodizing	High corrosion resistance, abrasion resistance, paint and dye base	All alloys; no assemblies with other metals; difficult to color die castings; not as abrasive resistant; longer time required for dyeing	Not proprietary; 5 to 10 pct chromic acid by weight	30 to 90 min, 1 to 3 amp per sq ft, 40 v dc, 95°F, steel tank and cathode, aluminum racks	0.00001 to 0.00008 in., 250 hr and up
CHROME-ALUM** (Electroplating process)	For plating on other metals, for soldering, decorative purposes, hardness, etc.	Assemblies of other alloys and assemblies of aluminum cannot be treated	Chrome-Alum Corp.	Oxalic acid anodize, and modify coat and nickel plate	Thicknesses same as on steel
ALUMON** (Electroplating process)	For plating on other metals, for soldering, decorative purposes, hardness, etc.	Any metal may be plated direct, preferably nickel first	Enthone Corp.	Immersion in a solution at room temperature as preparation before plating	Thicknesses same as on steel
PREPLATING PROCESS** (Electroplating)	For plating on other metals, for soldering, decorative purposes, hardness, etc.	Any metal may be plated direct	Colonial Alloys Co.	Immersion in a solution at room temperature as preparation before plating	Thicknesses same as on steel
PHOSPHATE COATINGS** (Such as Bonderizing)	Paint base	No abrasion resistance, only a little corrosion resistance; for paint adhesion	Parker Rustproofing Co.	3 to 5 min immersion at 180° to 200°F	Not appreciable thickness, no appreciable salt spray increase
VACUUM IMPREGNATION***	For castings; to fill up pores of castings to withstand pressure	Limited to castings	Ault-Wiberg No. 88 Bakelite Corp. DuPont Co., and others	Castings are impregnated with specific lacquers in a vacuum	Not appreciable, no appreciable salt spray increase
ALUMINUM Immersion coloring	For paint base for blackening, etc.	All alloys and assemblies may be treated; limited range of colors; for identification purposes	Colonial Alloys Co.	Two immersion baths, one at room temperature and one at elevated temperature	No abrasion resistance, no dimensional change, 25 to 50 hr salt spray resistance

* Meets Army and Navy QQ-A-696a specifications.

** Permitted by Army and Navy only with their specific approval upon submission of specimens. Aluminum should never be painted without preparing the surface by one of the approved processes. Prime coats are invariably one of the zinc chromate primers, one or two or three coats, as specified.

*** One part of sodium silicate, 40° Be, to 4 vol of water at 150°F for 30 min, followed by a 1-min dip at room temperature in 1 to 5 pct sulphuric acid and baked at 300°F for 30 min is a procedure used to some extent in sealing anodized aluminum castings; however, it is not as satisfactory as vacuum impregnation.

75—Cadmium is absorbed and therefore unsuitable as an undercoat for silver.

76—Ferrous sulphate neutralizes chromium in nickel sulphate baths, pH 5.4 to 5.8, (adjust the pH with nickel carbonate) stir and filter and readjust the pH to operating range.

77—High metal ion concentration with low metal content produces large crystals and unsatisfactory throwing power; correct by addition of a salt with a common ion.

78—Bright nickel baths filtered through activated carbon removes the brighteners; therefore brighteners must be added, if permissible.

79—Lead fluoride baths are determined daily for caustic soda contents; rough deposits occur with excess, black deposits occur when caustic content is low, green anode indicates a favorable operating condition.

General Operating Data

For cyanide bath deposits, to avoid "spotting-out" of the metal either dry in warm sawdust, or by forced air drying, or use a dilute (2 pct) phosphoric acid or sulphuric or acetic acid bath. Barrel burnishing also closes pores and assists in preventing spotting-out. Rinses should be in alternate cold and hot water.

Electrolytic cleaning of nickel prior to chrome plating passivates the metal. For cleaning metal, see the data in the cleaning tables.

Improved adhesion results from a 1-sec dip of the copper deposit in 1:1 nitric-sulphuric acid solution prior to nickel plating.

An excess of 4 oz of copper in the chrome bath lowers the efficiency; discard the electrolyte.

Owners of proprietary processes have specific knowledge and experience pertaining to their particle specialties and should be consulted regularly. This article does not attempt to other than generalize in reference to proprietary finishing processes.

Decorative chromium and hard chromium baths and controls do not necessarily differ and the deposits differ only in thickness and to some extent to the basis metal or undercoat.

Decorative chromium when applied to steel or aluminum attains its best performance when deposited on nickel plate, which in its turn is undercoated with at least a flash of copper. Decorative chromium may be deposited directly on brass; however, increased corrosion resistance results when a

TABLE XXIII

SURFACE TREATMENTS OF MAGNESIUM ALLOYS

(Numerals indicate relative values; higher numbers are for progressively decreasing values)

Treatment	Color of Finish and Dyeability	Time and Number of Operations	Paint Base Quality (Relative Values)				Relative Abrasion Resistance of Film	Restrictions
			Protective Value in Salt Water, H-Alloy Castings	Paint Adhesion and Atmospheric Exposure Relative Values				
				H Alloy Casting	F Alloy Wrought	M Alloy Wrought		
Chrome-pickle (Dow No. 1)	Yellow	2 minutes One bath	3	2	2	7	6	Dimensional change 0.001 in.
Caustic pressure (Dow No. 6)	Gray to bronze	30 minutes Two operations	2 to 3	2 to 3	5	5	1	Require autoclaves, expensive
Hydrofluoric dichromate (Dow No. 7)	Dark-brown to black	60 minutes Two baths	1	2	3	7	4	Good on all alloys but M, health hazards
			U. S. Navy Spec. 407, Amend. 1, Aero., Army Spec. 98. 200, 10B Par. E-39					
HF-alkaline dichromate (Dow No. 8)	Dark-brown to black	60 minutes Three baths	2	2	3	7	4	Good on all alloys but M; health hazards
			U. S. Navy M-382, Army, Aero., acceptable on request					
Galvanic anodizing (Dow No. 9)	Gray to black	30 minutes Three baths	2	2	3	3	4	Poor covering power in recesses
			U. S. Navy M-395 and Aero. Amend. 1					
Chrome sulphate (Dow No. 11)	Gray to black	15 minutes One bath	5	2 to 4	4	4	6	Low relative values except where low electrical resistance is wanted
Selenium	Reddish-brown	15 minutes Two baths to take all alloys	5	2	3 to 4	4	4	Low relative values and expensive
Caustic anodize (Dow No. 12)	Gray; dyeable	30 minutes Two baths	4	3	3	4	3	Low relative values and expensive, except where colors are wanted
PT-13d (Navy), or H alloy only	Gray	30 minutes Two baths, Anodic	2	2	3	5	5	Poor covering power
MAC film (Colonial)	Black decorative coat	20 minutes One bath	1	2	3	5	4	
Plating processes (Dow) (Colonial)	Proprietary baths	Three-four baths	8					Only for decorative indoor service
Anodizing (Consolidated Aircraft Corp.)	Proprietary baths		Claimed to present high corrosion resistance and abrasion resistance and paint adhesion values					No relative values ascertained
Vacuum No. 988 impregnation (Ault & Wiborg) and others	Proprietary baths							No relative values ascertained for Mg and Al castings
No treatment	Powdery-gray	None	7	6	7	7	6	Paint adhesion very poor

Zinc chromate, glycerol phthalic primer: One coat for all but marine exposures, two coats for marine exposures. A surface coat of 10 pct phenolic resin, one part of linseed oil, 13 parts of tung oil (1.5 to 2 pct aluminum powder may be added) is an excellent mixture. Lanoline (30 to 40 pct) in mineral solvents serves as a fair resistant coat under some conditions. Baked finishes on die and sand castings are usually stearin pitch or gilsonite in linseed oil and driers; baking temperatures 390°F. Synethetic resins, which may be of up to three coats, are baked at 225° to 250°F. A surface coat between primer and the finishing coat results in a smoother finish. All paints and organic finishes are applied to treated surfaces.

nickel deposit underlays the chrome. Hard-chromium deposits on steel, however, is usually deposited directly on iron and steel.

For both decorative and hard-chrome baths excellent results are obtained with an operating temperature of 135°F to 140°F 40 to 45 oz of chromic acid per gal of water, a sulphate content of 0.55 to 0.65 oz per gal of solution.

Usually the steel is etched prior to hard-chrome plating by an anodic operation at 2.5 to 3.0 v in a solution of 28 oz chromic acid per gal of water for ½ to 15 min. depending on thickness of deposit to be applied. Moly steels require an anodic etch in 25 pct sulphuric acid. Cleaning the steel prior to the anodic etch accelerates the etching process. The cleaning procedure is in a 16 oz per gal caustic soda bath at 6v (stainless steel requires cathodic cleaning). Proper cleaning is indicated by ability of surface to retain a water film. After etching the work is allowed to remain in the chromic acid plating bath without current for about 5 min, after which the voltage is raised gradually until normal voltage is reached.

A porous chromium deposit is a hard-chrome plate which has been etched to present a suitable surface for the retention of an oil film. The chrome plate may be etched to present a pitted or a network type of etch, the etch may be done mechanically or chemically or electrochemically; the latter two are in commercial use. The chemical etch procedure is in hydrochloric acid, the electrochemical procedures are by the use of anodic current in chrome acid or cathodically in Hcl, H_2SO_4, etc. The etching procedures are proprietary, being covered by patent Nos. 1,956,104, 2,248,530 and 2,314,604.

Honing with alumina or silica carbide and polishing, using pumice on a stitched wheel, generally follows the etching processes.

Plating on Plastics: Preparation as

TABLE XXIV

METAL ETCHING PROCEDURES

Metals	Baths (May be Still or Agitated, or Sprayed)	Operating Temperature, °F	Volts	Current Density, Amp Per Sq Ft	Metal Removed Per Min	Remarks
Aluminum	3 parts nitric acid, 1 part hydrofluoric acid	Room	X	X	0.0005 in.	Pitch lined tank, fine etch
Aluminum	Tartaric acid solution, or acetic acid solution, or iron chloride solution	Room to 150	X	X	Up to 0.001 in.	Coarse etch, pitch lined tanks
Aluminum	Anodizing process, Aluminum Co. of America; Colonial Alloys Co.; proprietary processes	70 to 100	24 dc or 20 to 30 ac	12.5 dc or 20 to 38 ac	0.0002 to 0.0004 in. added in ½ hr	Insulated tank, highly adsorptive film, can be dyed
Brass or copper	10 pct sodium chloride or 38 pct (42°Be) iron perchloride, or 10 pct chromic acid	Room	8 to 10	1 to 3	0.0005 to 0.001 in.	Lead or graphite anode, insulated tank. Follow by immersion in sodium stannate and cyanide solution
Nickel	45 pct (62°Be) sulphuric acid	85 to 140	8 to 10	280 to 560	0.0005 in. in 10 to 15 sec	Ceramic tank, lead or graphite cathode
18-8 stainless steel	Ferric chloride solution, or nitric acid solution, or ferric sulphate solution	Room	5 to 6	1 to 2	0.0005 in.	Ceramic tank, lead or graphite cathode
Steels (alloys)	25 pct by weight of sulphuric acid	Room	8 to 10	200 to 500	0.0005 to 0.001 in. in 5 min	Ceramic tank, lead or graphite cathode
Steel	Ferric chloride solution, or ferric sulphate solution	Room	X	X	0.001 in.	Immersion process, coarse etch, ceramic tank
Steel	1 gal 40 pct (42°Be) ferric chloride, 1 gal hydrochloric acid	Room	X	X	0.0005 in.	Immersion process, fine etch, ceramic tank
Silica steel castings	Hydrofluoric acid and hydrochloric acid	Room	X	X	0.0005 in.	Pitch or rubber-lined tank, immersion process
Steel	10 pct sodium chloride solution; hot solution of 3 to 5 pct ferric sulphate (ferrisul), non-electrolytic, also is used	Room	5 to 6	1 to 2	0.001 in.	Ceramic tank, lead or graphite cathode
Zinc	5 pct nitric acid solution	Room	X	X	0.002 in.	Ceramic tank, immersion process
Zinc Eastman Kodak process	10 to 25 pct copper sulphate and 20 pct sodium acid sulphite and 0.005 pct wetting agent	Room	X	X	0.0005 to 0.001 in.	Immersion process, fine etch

ETCHING RESISTS—Transfer of design by the use of steel dies and gelatin pads, or by the silk screen process, and for very large production by the lithographic (offset) method are the usual procedures. Varnish-base inks are used. The resist may be dusted over with resin and dragons blood then baked. Varnish or lacquer is applied to protect the reverse side of the metal against etching. Generally a mixture of ordinary mineral and lacquer solvents is used to remove lacquers and varnishes.

Besides prepared resists on the market the following are typical resists: (1) 9 fl oz of glue and 16 fl oz of water as a solution mixed with a solution made of 8 fl oz of water and 1½ oz of ammonium dichromate. (2) Or a resist made of the following: 250 g shellac, 20 g castor oil, 500 g methanol, 700 g propanol, 200 g isobutyl-alcohol and 4 g of caustic soda, to which solution is added a solution made of 10 pct ammonium, dichromate, the latter to comprise 90 pct of the total solution. Use shortly after preparing; may not be stored.

EMBOSSED METALS—Embossed effects may be obtained by metal etching procedures, as noted in table XXIV (which tend to weaken the metal), or by mechanical means.

Stamping operations have been too costly and limited as a procedure for many embossing requirements. Recently, however, a continuous roller embossing operation has been developed by the Rigid Tex Corp., Buffalo, which is said to produce more effective results at lower costs. Embossed metals may be utilized without further finishing or they may be plated. Aluminum may also be anodized or anodized and colored to further enhance the designs and multiply the number of optical effects. Wood graining effects followed by appropriate anodic dye coloring procedures will simulate wood.

Functionally, embossed metals have increased rigidity, strength and hardness; decoratively, many designs present two and three-tone effects and render finger prints less obvious, as well as serving to break up the monotony of plane surfaces.

to cleaning and surface roughening varies with different plastics. In the chemical immersion process different reducers are required for some types of plastics. For example: (1) Catalin, urea resins, celluloid, Polystrene, Methye, methacrylates must be wet, tumbled for 1 to 5 hr using water and pumice, and lightly polished. (2) Cellulose acetate requires in addition to tumbling a caustic soda treatment prior to bonding. (3) Rubber must be immersed in benzol or acetone. (4) Casein plastics are immersed in 3 to 4 pct hydroquinone. (5) Bakelite may be plated merely by a ½-hr immersion in a mixture of silver oxide, ammonia and water.

Proprietary Plating Baths

IN addition to the standard electrolytes and the few proprietary plating baths that have been outlined in the foregoing charts, the following are among the better known proprietary electrolytes:

Chromium: U. S. Chromium Corp.; Vander Horst Corp. of America (porous chromium); Warner Electric Co. (Skalite process); Universal Electrochemical Corp.; and there are also chromium electrolyte addition agents which claim improved results.

Bright and semi-bright nickel baths: Udylite Corporation, McGean Co., Hanson-Van Winkle-Munning Co., Pyrene Corp., Harshaw Chemical Co., and many others. But a few of the patents are Nos. 2,114,006, 2,198,-268, 2,191,813, 2,112, 818 and 2,026,-718.

Nickel plating baths for plating directly on zinc: Zialite Corp. patent No. 2,069,560; General Motors Corp. patent No. 2,330,529 are typical baths. It is claimed these baths operate with better throwing power than a high-sulphate nickel bath which is otherwise required when plating on zinc die castings.

Cadmium: To list all of the patents covering cadmium plating would require several pages, however a few typical ones are Nos. 2,164,924, 2,154,-468, 2,154,469, 2,154,555, 2,154,451, 2,021,592, 2,070,871, and 2,186,579. In addition to the patents covering the

TABLE XXV

TYPICAL IMMERSION TREATMENTS FOR INCREASED CORROSION RESISTANCE—PAINT ADHESION AND APPEARANCE

Description of Finish	Basis Metals	Typical Temperature, °F	Time in Bath, Min	Tank Material	Salt Spray Resistance, Hr	Paint Base	Dimensional Change	Data or Source
See tables XXII, XXIII	Aluminum and magnesium							
Blackening	Aluminum and magnesium	160 to 180	10 min	Steel and ceramic	50 to 200	Excellent	None	Colonial Alloys Co., Philadelphia; Enthone Co., New Haven
Blackening	Brass and copper	160	5	Ceramic	10 to 50	Good	None	Colonial Alloys Co., Philadelphia Enthone Co., New Haven Frederick Gumm, Kearney, N. J. Du-Lite Chemical Co.
Blackening	Iron and steel	290	10 to 15	Steel	10, unoiled; 50 oiled	Good	0.00002 to 0.000006 in.	*Oil treat, wax or follow by dip in hot 10 pct sodium dichromate solution if desired
Blackening	Stainless steels	150 to 210; 615 to 750	15 to 20	Steel	Improved	Fair	Slight	Rustless Iron & Steel Corp., Baltimore; Colonial Alloys Co., Philadelphia
Olive drab, and blackening (An-P-32a Rev. 2)	Cadmium and Zinc	150 to 200 also at room temperature; electrolytic processes also	1 min 10	Steel or ceramic, or acid lining depending on process	100 to 400 and more on some processes	Good	Slight to 0.00004 in.	Alrose Chemical Co., Providence, R. I.; Colonial Alloys Co., Philadelphia; Enthone Co., New Haven, Conn.; Puritan Mfg. Co., Waterbury, Conn.; Rheem Research Products Co., Baltimore; United Chromium Co., New York
Immersion, Copper	Steel	Room temperature and up	1 to 2	Ceramic	Slight improvement	No	0.0000001 in. and less	1 oz copper sulfate, 0.5 gal sulfuric acid, 1 gal water
Immersion, Silver	Steel	Room temperature and up	5 sec ½ min	Ceramic	Slight improvement	No	0.0000001 in. and less	0.2 oz NaCN, 0.5 oz AgCN, 0.5 oz NaCl, 1 gal water
Immersion, Tinning	Steel or aluminum	Room Temperature and up	Few seconds	Ceramic	Slight improvement	No	0.00001 in.	45 to 60 g per liter tin stannate, 6 to 8 g per liter caustic soda, and 1 liter H^2O
Immersion Tinning	Brass	Room temperature	1 to 3	Steel			Slight	Alrose Chemical Co., Providence, R. I. Colonial Alloys Co., Philadelphia
Phosphetizing (AxS-1245 Rev. 1-TAC-ES-431-C)	Aluminum, steel, iron, zinc, cadmium	190 and up	5 to 60	Steel	½ hr, unoiled, on steel	Excellent	0.0002 to 0.0005 in.	Chemical Paint Co., Ambler, Pa.; International Rustproofing, Cleveland; Parker Rustproofing Co., Cleveland; Oakite Co., New York; American Chemical Paint Co., Ambler, Pa.
Zinc, surfacing for paint	Zinc	Room temperature and up	Few seconds	Steel, ceramic		Good	None	Colonial Alloys Co., Philadelphia; Nielson Chemical Co., Detroit; also 8 oz $CuSo^4$ to 1 gal water improves adhesion slightly
Zinc, surfacing for paint	Zinc	140	5 to 12 seconds	Steel, lead		Excellent	None	Cronak process, New Jersey Zinc Co., New York; 3 pct chromic acid slightly acidified with sulfuric acid
Identification coloring of metals	Steel, aluminum, etc.	150 to 200	5 to 15	Steel, ceramic			None	Colonial Alloys Co., Philadelphia Krieger; Great American Color Corp.

* Alrose Chemical Co., Providence, R. I.; Colonial Alloys Co., Philadelphia; Enthone Co., New Haven, Conn.; Heathbath Co., Springfield, Mass.; Michell Bradford Co., Bridgeport, Conn.; Tobber Chemical Co., Portland, Conn.; Du-lite Chemical Co.; Empiro Solvents Co., New York; Frederick Gumm Chemical Co., Kearny, N. J.; E. F. Houghton Co., Philadelphia; Puritan Mfg. Co., Waterbury, Conn.; National Research Corp., Vacuum Engineering Div., Boston, offers equipment for vaporizing metallic aluminum, chromium, silver, gold and rhodium on metal and other materials.

above, there are many others covering the brightening additions for cadmium baths.

Special Plating Baths

Copper baths for high speed and bright plating: A few representative baths are: Unichrome electrolyte of the United Chromium Corp., and the high-speed copper bath controlled by DuPont. The latter also has a bright-brass bath, as does Weinberg in patent No. 2,181,173 and others.

Gold: A. Robinson & Son Co. and David K Products Co., both of New York City, and others offer prepared gold electrolytes.

Indium: Indium Corp. of America and others have patented indium baths. Indium has an application in plating steel and iron for bearing purposes, and it is claimed that superior corrosion conditions and tarnish proofing occurs when this metal is plated on silver.

Platinum: Baker & Co. "P" salt, patent No. 1,779,436; Precimet Laboratories of New York, and several others.

Tin: Hanson-Van Winkle-Munning Co., and many others, offer bright-tin baths and high-speed tin baths of both the acid and alkaline types.

Zinc: There are a number of bright-zinc baths, of which the Zinc-O-Lyte bath of DuPont, and that of Hanson-Van Winkle-Munning Co., and Oplinger's patents Nos. 2,146,430 and 2,355,505 are but a few of the many patented baths.

Alloy plating baths: Many patents exist for alloy plating. Probably the most recent ones of interest have been represented by the developments of the Nu White Products Co. and Jernstedt of the Westinghouse Electric Co., and Special Chemical Co., New York. These baths deposit an alloy of copper, zinc and tin. It is claimed that a reflectivity of about 82 to 85 pct is obtained, which is comparatively tarnish proof, solderable, abrasion resistant and may be still or barrel plated.

Anozinc process: A development of the United Chromium Corp., and a similar process of Colonial Alloys Co., for obtaining a black, or yellow, and other colors, together with high-corrosion resistance on zinc, by means of electrolytic processing.

Corronizing: Another alloy depositing patent though it does not deposit an alloy, since zinc and nickel are deposited separately. However these metals are alloyed by a subsequent heat treatment and this process has promise in large-production corrosion-resistance applications.

Rainbow plating: A United Chromium Corp. development for coloring certain metals. Involves the use of 20 g per liter of ammonium molbdate and 1 g per liter of sodium cyanide, operated at room temperature, with a current density of 4 amp per sq ft for 60 sec; cathodic for high polished copper, nickel and brass.

Plating for Color

Coloron Corporation: This corporation offers a process for the electrolytic coloring of stainless steels. Maroons, brass, gold, bronzes; chrome, green may be obtained in a dilute sulphuric acid bath with the work as the anode. Operation at 165° to 210° F for 19 to 45 min. Corrosion resistance is improved and it is claimed that the abrasion resistance may be increased five times by heating the processed work for 2 to 3 min at 800° to 1700°F. Depth of color is said to be 0.0001 in. The stainless steel must contain 7 pct or more of chromium. Austenitic steels with nickel present the best color range.

The above by no means covers the field of patented plating processes.

The Promat Division, Poor & Co., offers processes for plating cadmium, copper and zinc by means of special salts and the use of superimposed ac on dc. Increased rates of deposition and other advantages are claimed.

Plastics: Plating on plastics presents many approaches and hundreds of patents, among the better known being the processes of the Metalplast Corp., Acheson Colloidal Graphite Co., Metalon Process Co., New York, and Plating Processes Corp., Holyoke, Mass.

Advantages of plated plastics:

(1) Enables the use of off color scrap for moulding.

TABLE XXVI

GOVERNMENT—ARMY—NAVY SPECIFICATIONS FOR ZINC CHROMATE PRIMERS

Specification	Zinc Chromate, Pct	Asbestine, Pct	Iron Oxide, Pct	Other Pigments, Pct	Type Vehicle	Total Pigments, Pct	Total Solids, Pct	Weight Per Gallon, Lb	Viscosity	Color
Bureau of Ships 52-P-18	24.0	11.4	2.2	8.9	A-B	44.5	65.5	11.2	72K	Yellow
Air Corps 14080	25.5	4.5	x	x	0	30.0	(2)280	0	15 to 20 CP(1)	Yellow
Army and Navy Aero AN-TT-P-656	28.0	5.0	x	x	B-C	33.0	65.0	9.8	25 CP(1)	Yellow
Ordnance AXS-948	5 minimum	x	25.2 minimum	45.8	B-D	72.0	60.0	0	0	Red
Ordnance AXS-750	3.2	x	16.1	28.7	B-D	46.0	65.0	0	75 to 150 (3)	Red
Ordrance ES-680-101	5 minimum	x	25.2 minimum	45.8	B	x	x	x	75 to 150 (3)	Brown
Ordrarce PXS-783	28.0	5.0	x	x	B-C-E	33.0	60.0	10.0 minimum	0	Yellow
Navy Aero P-27-B-2	28.0	5.0	x	x	B-C-E	33.0	60.0	minimum	0	Yellow
AMS-3110	46.8	8.2	x	x	B-C-E	55.0	60.0	minimum	50 CP(1)	Yellow

A = drying oil, phenolic resin varnish. B = alkyd resin. C = dispersion resin. D = drying oil, ester gum varnish. E = congo copal. CP = centipoises; K = optional K, Krebs units of viscosity; (1) viscosity after reduction; (2) solids after reduction; (3) seconds, No. 4 Ford cup; O = optional.

Zinc chromate is best primer as it gives two-way protection, being particularly effective on magnesium, aluminum, as well as for steel. Many Army and Navy specifications require 30 pct zinc chromate contents in iron oxide primers used on steel. The primer coat should not be opaque. Zinc chromate primer must not be used if it is to be followed by a lacquer with over 15 acidity.

(2) Elimination of undesirable properties of plastic surface such as oil, water and solvent absorption.

(3) Distortion of base organic may be prevented.

(4) Resistance to heat and impact is increased.

(5) Greater dimensional stability.

(6) Presents excellent properties for electrical shielding and electronic devices.

Methods used in plating on plastics

(1) Varnish conducting powders (wax, graphite, plumbago, lacquer, copper, powder, shellac, silver sulfide.)

(2) Metal spray.

(3) Cathodic sputtering at 10,000 to 20,000 v; gold, silver, aluminum.

(4) Metal evaporation in vacuum.

(5) Chemical solution immersion.

The first method is still used, the second is seldom used, and procedures (3) and (4) have specialized applications, and (5) is the most widely used commercial procedure and in the main is covered by proprietary processes.

Production Painting and Dye Coloring of Metals

THE word painting is used in this article as a general term to include lacquering, enameling, etc.

The application methods used in production painting are spraying, dipping, tumbling, roller coating and brushing. The same resins and pigments may be used in all methods; however, different formulations as to the ratios of solids to liquids and a change in thinners to suit the requirements of a method is the general practice.

Spray painting generally makes use of compressed-air spray guns, though gravity feed occasionally is operated. In order to obtain the best results in spray operations the following instructions must be followed:

(1) Correct air cap and fluid nozzle for the type of paint.

(2) Correct solvent and proportioned correctly, NOT by guess work.

(3) Correct viscosity of the material must be maintained through the use of a suitable device, such as a viscosity cup.

(4) The rate of flow to be 10 to 12 gal per hr.

(5) Nozzle distance from the work to be 8 to 10 in.

(6) The speed of stroke to be about 200 fpm.

(7) The air pressure at the nozzle to be at least 5 lb. To increase the pressure use a smaller nozzle. Excessive air pressure tires the operator and over-atomizes the paint.

Spray painting involves the use of spray booths and great care must be

TABLE XXVII

COMPARISONS OF PHYSICAL FACTORS OF A FEW SYNTHETIC LACQUERS AND INFRA-RED DRYING DATA

Coating and Resins	Radiant Drying		Resistance to the Listed Condition						Comparative Physical Factors			
	Temperature, °F	Time	Heat	Sunlight	Water	Marring	Weak Acids and Alkalies	Mineral Solvents	Flexural Strength	Adhesion	Toughness	Color Retention
Phenol formaldehyde	Air dry	4 to 5 hr	E	F	G	E	G	E	G	G	E	G
Urea formaldehyde	250 to 325	9 to 4 min	G	E	F	E	F	E	E	E	G	E
Urea formaldehyde and Alkyd resin	225 to 300	6 to 3 min	*	*	*	*	*	*	*	*	*	*
Urea formaldehyde and with synthetic	Air dry		*	*	*	*	*	*	*	*	*	*
Alkyd	Air dry, 160	½ min	G	E	F-G	F	G	G	G	G	G	E
Melamine	300 to 400	6 to 3 min	G	G	G	G	G	G	F	G	F	E
Melamine and Alkyd mixture	180 to 200	10 to 4 min	*	*	*	*	*	*	*	*	*	*
Vinyl chlorides	Room to 200	5 to 60 min	F-G	E	F	F	G	G	G	P-F	F-G	G
Methacrylates	Room to 200	5 to 60 min	G	G	G	G	G	G	G	G	F-G	G
Chlorinated rubber	Room		P	F	F-P	F-G	G	P	E-G	F-G	G	P
Nitrocellulose lacquers	Air dry, 110	10 to 2 min	F	E	P-F	F-G	F	F	G	G	E	P
Mixed lacquers	Air dry, 150 to 200	45, 15, 6 min	*	*	*	*	*	*	*	*	*	*
Synthetics with 20 to 35 pct oil	Air dry, 200	30, 35, 16 min	*	*	*	*	*	*	*	*	*	*
Synthetics with 50 pct oil	Air dry, 225 to 250	2 to 3 hr 1½, 1 hr	*	*	*	*	*	*	*	*	*	*
Synthetics with cobalt and lead driers	Less than above	Less than above	*	*	*	*	*	*	*	*	*	*
Synthetics with over 50 pct oil	Air dry, 225 to 250	2½ hr, 40, 30 min	*	*	*	*	*	*	*	*	*	*
Shellac	Special for hot applications	Gun	F	E	P-F	F-G	P	P	G	F-P	F-P	P
Oil-base paints	300	60	Properties depend on formulation									

* Physical characteristics tend to be modifications of the merits and demerits of the components.
E = Excellent; G = Good; F = Fair; P = Poor.

taken against fire and health hazards. One of the more popular approaches to obtain the ultimate in safety is through the use of water-fall arrangements, i.e. a curtain of water is interspersed between the sprayer and the exhaust fan. The curtain of water prevents much of the spray from entering the flue; in large operations special chemical additions enable the paint to be reclaimed and forwarded to the paint manufacturer for reconditioning.

Dipping

Dipping: For certain types of work dipping operations present a logical approach, but it is just as necessary to follow basic procedures, such as timing as to the entrance rate, length of stay in the dip tank, and the withdrawal rate of the work in order to avoid excessive tearing, etc. Practically any paint may be used in a dip tank when it is brought to the correct viscosity, insofar as a one-coat job is concerned; but for two or more dip coatings the dip tank is limited to the use of paints which do not contain a solvent which will tend to dissolve off the first coat. Maximum speed of withdrawal of work from a dip tank is 4 in. per min.

Tumbling and centrifugal painting: Certain types of small work are very inexpensively finished in revolving horizontal barrels or drums. The drum is filled with a work load of one half to one third capacity, the paint consistency, etc., is as recommended for the work by the paint manufacturer, and the drum is revolved at 25 to 30 rpm for 5 to 20 min. A similar result is obtained by specially designed vertical drums, in which the work is placed in a wire basket and the paint caused to apply itself to the work by a centrifugal spray. The paint may be subsequently dried in the same device or transferred to a similar drum for centrifugal drying to remove excess film.

Roller coating: Undoubtedly the least expensive method of applying paint in the production finishing of sheet metal is by passing the sheets under rollers by means of conveyor belts or tables. A uniformity of finish may be arrived at in roller coating not possible in other methods.

Brush painting: Is used comparatively little for production finishing, as it is expensive and uniform results are difficult to obtain; however, it has some application for touch-up work.

Electrostatic spray-painting and detearing: Is not an application method in the usual sense, but it is a control method. It offers a means for (1) minimizing tear formations, (2) presents more uniform coats, and (3) saves paint as it prevents waste resulting from over-spray. The work to be sprayed may be passed through an electrostatic field by means of any suitable conveying equipment. The electrostatic field is formed by No. 30 copper wire surrounding the work at a distance of about 11 in., the wires are centred approximately 10 to 12 in., and 10 milliamperes at 100,000v is applied; for detearing dipped work about 5 milliamperes at 60,000v to 80,000v is used.

Baking and drying: Baked finishes give about five times the abrasion resistance and double the hardness of air-dried finishes. Therefore, despite the higher costs of material, in production most finishes are baked.

Radiant heat either in the form of infra-red lamps or radiant-gas heaters have wide application; however, there is a definite limitation to radiant baking and drying, hence convection heating or a combination of radiant and convection heating is required for many jobs. Convection heating may be through the use of direct-fired ovens, electric-resistance heating, gas, or steam coils. It is possible to get up to 300° F by the use of steam through steel coils, and up to 400° F or even better if copper or copper-finned coils are used. See tables XXIX and XXX.

If a vapor degreasing machine is placed anywhere in the same building with a baking oven, great care must be used to prevent any chlorinated vapors escaping, as the vapors will follow the natural draft to the oven. Any chlorinated vapor which enters the oven will cause wrinkling of the finish.

Primer Coats

Primer coats should be flat, nonglossy, thin and not opaque, as opaque coats provide less protection and adhesion. In addition, flat coats have less pigment contents and have more uniform porosity. In some instances a primer coat offers two-way protection in that besides the physical protection afforded by the coat, it also gives electrolytic protection. Zinc chromate primers are in this category, hence they are the only primer practically specified by the Army and Navy for aluminum and magnesium, as well as to a very great extent on steel. Table XXVI gives the data on A-N zinc chromate primers.

A-N Spec. P-27 (Navy test) for zinc chromate primers requires that after mixing (1 part pigment to 3 parts toluene for spray working, or 2½ parts of the solvent for dip coats) the mixture is permitted to stand for 24 hr, it is then shaken and if no settlement occurs in 30 sec it indicates a passable product. Spec. N. PF-9C Navy Aeronautics calls for 0.0005 in. of thickness for a one-coat film, with 0.001 in. for three coats.

Lacquers and Enamels

Synthetic lacquers and enamels are in the main restricted to materials based upon alkyd glycerol phthalate, urea formaldehyde, phenolic formaldehyde, melamine, vinyl chloride, etc.

Natural resin lacquers and varnishes embody principally one or more of the following resins: congo, damar, kauri, manila, pontianac and shellac. Any of these may be combined with nitrocellulose to form a mixed lacquer.

Combinations of synthetic lacquers, as noted in table XXVII, may be combined in order to obtain a modification of the undesirable qualities, without materially lowering the merits of either. Thus, alkyd resin imparts (1) abrasion resistance, (2) adhesion, (3) color retention, (4) enables the use of cheaper thinners, and (5) shortens the baking schedule. The lower the alkyd contents the better the water resistance and stability of the combination lacquer. Phenolic resins in combination with oleoresin varnish impart remarkable durability and weather resistance, with good gloss, good color and fair adhesion and fast drying.

Chlorinated rubber additions of 20 to 25 pct to an alkyd lacquer presents a varnish which is tough and may be pigmented. This combination is very adaptable for finishing large units such as washing machines. Chlorinated rubber also may be added to oleoresin lacquer to secure a low drying range varnish, such varnishes are not applicable to units exposed to mineral or vegetable oils. Vinyl chloride resins and combinations are of particular interest to the plater because their resistance to ionic penetration gives them wide use as stop-off lacquers; the vinyls are also the base for the so-called keg-lined beer cans.

Thinners

Resin thinners for brushing are butanol, diacetone, alcohol, zlyol, L.D. Naphtha, ethyl acetate, ethyl alcohol; for brushing thinners butyl acetate, ethyl alcohol, toluol and butyl alcohol are the major ones. The flash point of thinners are as follows: gasoline 10 to 40, acetone 15, ethyl acetate 45, toluol 50, V.P.M. Naphtha 60, benzol 59, zlyol 84, zylene 84, turpentine 90 to 100, alcohol 105, kerosene 100 to 150 in ° F.

It is difficult to lacquer nickel or

chromium plate, though there are special lacquers offered for this purpose. Aluminum, magnesium and zinc require surface treatments, as noted in tables outlining the surface treatments of these metals.

Blushing or blooming of lacquer may be due to water in the spray or an over amount of solvent, or a solvent with too high a rate of evaporation. Dusting of lacquer is less apparent with the use of butyl or amyl-acetate thinners than with methyl or ethyl acetate. Gloss failure is due to improper mixing; high gloss presents better weather resistance. Lustreless high-pigmented paints have low weather resistance and require a good under-coat. Orange peeling usually results from an excess of air pressure. Sagging may be due to an undue excess of paint solids in the spray.

Testing of Coats

The relative resistance of paint films exposed to a 20 pct salt spray treatment indicates the relative resistance to weathering; thus, an excellent salt-spray resistance is 200 hr, a very good one withstands 100 hr, while a good resistance is 75 to 100 hr, and a fair resistance is indicated by a coat which resists 50 to 75 hr in the salt spray.

The flexibility test consists of bending the coated metal over different size mandrels; if a break occurs on a 3/16 in. mandrel the coat has poor flexibility, a break on a ⅛ in. bend gives it a fair rating, a 3/32 in. bend means a good rating, while if the break does not occur until a 1/32 to 1/16-in. bend is made the flexibility is very good.

Special Paints

Color maximents are offered for filling in recessed letters and figures, such as the products offered by Lincoln Products Co., Fort Wayne, Ind. For luminous paints see table XXXII.

Graining is a specialized art in which technic is more important than anything elso, so no data will be presented concerning the materials used. For applying two finishes simultaneously a multi-fluid spray gun is offered.

Dye Coloring of Metals

Aluminum and magnesium are prepared for integral dye coloring by anodizing the surface to form a coat with minute pores of the order of a 1/10 millimicron in size; the reaction in the electrolyte with the metal also forms a mordant, the mordant together with analine type dye forms a lake, just as in dyeing fabrics. The dyed film (in all colors and shades) unlike paint and lacquers cannot be peeled off as it is a part of the metal. The dyed coat gives an entirely different appearance than lacquer coats, i.e., an iridescent, Dresden China effect is created. Some colors are more sunfast than others: blues, yellows, blacks are more sunfast as a rule than greens and reds. Water fastness may be tested by a 60-min boil in water.

Color Tests

American Standard Association, New York, Specification and description Z-44-1942 recommends the use of the recording spectrophotometer, and The Munsell system of colors (Munsell book of colors), and the Inter Society Color Council method of designation (research paper R P 1239, U. S. Dept. of Commerce, National Bureau of Standards). Color comparisons may also be made in production by means of Glossmeters, Reflectometers, etc. Camouflage Color Specification of the Army, Spec. T-1213, Sup. A. B. U. S., Corps of Engineers, U. S. A., and N. Aircraft Standard Bureau of Aeronautics, Navy Department, Washington. Army color card issued by Textile Color Card Association, New York (approved by Quartermaster General).

A number of proprietary paint, lacquer varnish and enamel strippers are offered, typical of which are those made by the following: Colonial Alloys Co., Philadelphia; Enthone Co., New Haven, Conn.; Estox Products Co., Westville, Conn.; Fidelity Chem-Products Corp., Newark, N. J.; Phillips Chemical Co., Chicago; Standard Varnish Co., Staten Island, N. Y.; Sterling Varnish Co., Haysville, Pa.; Turco Products Co., Los Angeles.

Occurrence of Lead in Lead-Bearing Steels

WHEN lead is added to steel, it may occur in a segregated form towards the bottom of the ingot and in this form is readily detected by means of the exudation test which is used as a pass test for lead-bearing steels. Lead may also occur in association with inclusions in unsegregated material. From the lack of evidence of the existence of lead as discreet particles and on the assumption that lead is insoluble or only slightly soluble in steel, it has been inferred that lead is probably also present in a submicroscopic state of division.

W. E. Bardgett and R. E. Lismer of the Central Research Department of the United Steel Co.'s, Ltd., Stocksbridge, England, undertook an investigation of the mode of occurrence of lead in lead-bearing steels for the Committee on Heterogeneity of Steel Ingots of the British Iron and Steel Institute. Studies were conducted on leaded and non-leaded high-sulphur and manganese-molybdenum wrought steels and on 0.25 per cent carbon, 1 per cent manganese leaded steel ingots.

This investigation revealed that the bottom-discarded billet of manganese-molybdenum steel showed marked segregation, which occurred mainly toward the surface. The segregation consisted chiefly of streaks of metallic lead-containing particles of sulphide, oxide and steel. Other less numerous segregated lead-bearing streaks consisted of particles of oxide and sulphide within a matrix of oxide or silicate. Lead was found associated with sulphide and silicate inclusions as lead and in the form of oxide.

While normal methods of microscopical examination failed to reveal the presence of lead unassociated with inclusions, electrolytic etching in 10 per cent ammonium acetate solution revealed particles, believed to be lead, within the structure. These particles were not visible before etching. An electrographic method of lead printing, using caustic soda as the printing solution and sodium sulphide as the developing solution, clearly revealed the distribution of lead in the ingot. There was an increase in the size of the particles from the surface to a position about 4 in. from the surface, with a gradual change from a random to a slightly interdendritic pattern. From this position to the center, the distribution was generally similar. There was marked similarity between the lead distribution in the two ingots and at the top, middle and bottom positions.

Examination of lead-bearing specimens under the microscope during heating showed that segregated lead in a billet suddenly spurted out onto the surface at a temperature of 445

(CONTINUED ON PAGE 162)

New Equipment . . .

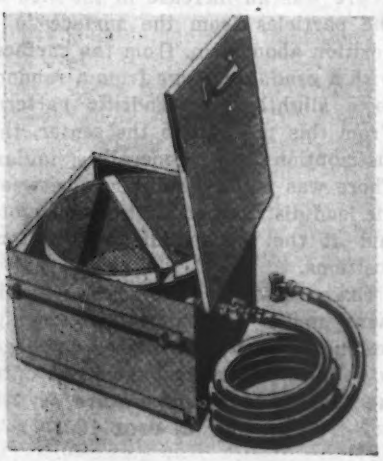
Finishing

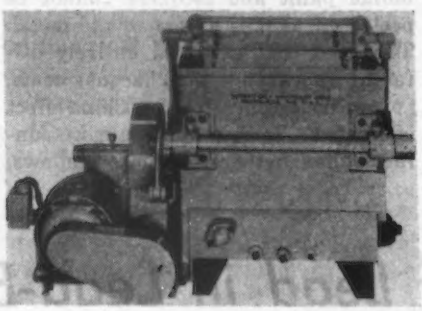
. . . Recent developments in cleaners, cleaning units, protectors, finishes, and infra-red heating units are described herein.

A LINE of alkaline, acidic, solvent and emulsion type detergents to cover a wide range of specific applications has been announced by *Optimus Detergent Co.*, 140 Church Street, Matawan, N. J. Various types of alkaline detergents are available such as heavy duty and light duty for steel etching, and non-etching for aluminum; those containing natural or synthetic soaps (wetting agents) for use in soaking tanks, and electro cleaners for anodic or cathodic cleaning. The acidic detergents are designed to remove oxide films from ferrous metals and aluminum where ordinary pickling procedures cannot be followed. The solvent and emulsion cleaners come in several types depending on whether the cleaning can best be accomplished by a simple solution of the foreign material in the solvent or whether an additional emulsifying agent is necessary.

Parts Cleaning System

A SMALL parts cleaning system and a line of cold cleaning solvents have been announced by *Gray-Mills Co.*, Evanston, Ill. Model P-27 is used for removing cutting oils, lubricants and for operations where small parts are to be cleaned in limited quantities. The cold cleaning solvents called Agitene, come in three types, regular Agitene for general purpose cleaning in removing cutting oils and other lubricants, super Agitene, a fast acting solvent for removing grease, tar and sludge, and speed Agitene for hard accumulations, residual gums and grease deposits. It is said to remove paint and sludge without harming metals.





Metal Parts Cleaner

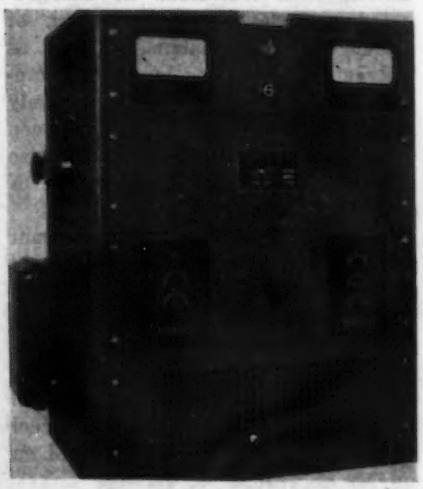
A METAL parts cleaner, the Simplex Model B, has been announced by *Sturdy-Built Equipment Corp.*, West Allis, Milwaukee 14. The operator loads the tray with the objects to be cleaned, throws the switch and the cleaner does the rest. The unit is of heavy construction, especially designed for installations where extremely tough working conditions are encountered. Special side tanks receive the floating oil and scum by the introduction of more soaking solution into the bottom of the main tanks. There is no loss of the solution. When the oil removal tank is full it can be drained and the oil filtered for further use.

Electrolytic Cleaner

AN electrolytic cleaner, Ferrodex, which cleans metal surfaces in a single operation has been announced by *W. D. McDermid Chemical Co.*, Bristol, Conn. Oil, grease, carbon, smut, drawing compound, pigments, emery, polishing and buffing compounds or just plain shop dirt are removed. The compound is said to have long solution life because it is stable at high temperatures without loss through evaporation. Because of the inhibiting action of the special buffering silicate developed for use with the cleaner very low solution decomposition takes place. It will work efficiently used either anodically or cathodically. Anodic treatment is always recommended when the character of the ferrous base metal is of poor quality.

Stabilized Low Voltage Rectifier

STABILIZED low voltage rectifiers have been announced by *Green Electic Co.*, 130 Cedar St., New York. The unit, illustrated, is rated at 200 amp, 0 to 3 v. Any voltage selected in range is said to be maintained to within 50 mv over load variation from 0 to 200 amp and with line voltage variation of + or — 10 pct. The voltage stabilization system includes a motor-driven powerstat and an electronic pilot device.



Plater's Cleaner

A PLATER'S cleaner which is said to eliminate calcium scale has been announced by *Kelite Development Lab.*, research division of *Kelite Products, Inc.*, Los Angeles. It is used in a hot tank with or without current for cleaning brass, bronze, copper, babbitt, pot metal and non-ferrous metals.

Aluminum Cleaner

FOR the hot cleaning of aluminum, an improved form of KDL No. 1 with cleaning action within the pH range which is safe for aluminum has been announced by *Kelite Products Inc.*, Los Angeles. The material is said to remove stamping inks and to provide a good surface for welding. It rinses free. It is supplied in powdered form in 125 lb and 500 lb drums.

Brass Cleaner

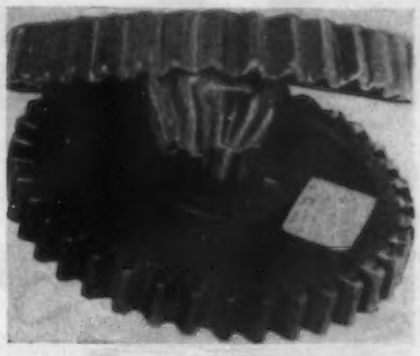
A BRASS cleaner has been announced by *Cowles Detergent Co.*, Cleveland 3. It can be used in a still tank with or without electric current and in washing machine equipment. Called KW, it is said not to attack or tarnish the metal and is also said to be adaptable to cleaning die castings.

Portable Sander-Grinder

A PORTABLE, electric hand sander-grinder on which endless abrasive belts operate over a flat or convex shoe has been announced by *Porter-Cable Machine Co.*, Syracuse 8. Called the Take-About Surfacer, Model A-3, it can be used in any position, horizontally, vertically, overhead or on its side. Features of the unit include a silent chain drive, needle bearing drive and idler pulleys, and a rubber covered drive pulley. Uses for the surfacer include burring steel bars, cleaning off of planer marks, resurfacing desks, cutting to the line and cleaning up metal forms or patterns, sanding an assembled desk, cleaning and leveling blackboards, cleaning off tool marks on steel bar after planing.

Plastic Compound

A PLASTIC strippable compound for protecting parts from corrosion and hazards of handling has been announced by *Eronel Industries*, 5714 W. Pico Blvd., Los Angeles 35. Called



Eronel Thermo-dip, it is applied by the hot melt method. It is said to be exceptionally stable, even after prolonged heating, and to remain transparent, allowing ready identification of detail on coated pieces. It is strippable from odd-shaped parts even after prolonged exposure and can be applied at temperatures ranging from 280° to 325°F., approximately 100°F. below its flash point. It can be remelted and re-used.

Acid Cleaner

AN acid cleaning and descaling compound, Pennsalt PM-90, has been developed by *Pennsylvania Salt Mfg. Co.*, Philadelphia 7. It contains addition agents for surface action and inhibition, and is used as a pickling bath concentrate in electroplating shops and also as an acid cleaner for removing water scales from boilers and industrial equipment. It is packaged in 115 lb carboys.

Protective Finish

AN Iridite finish which protects galvanizing from corrosion has been announced by *Rheem Research Products, Inc.*, Baltimore. Called Iridite Galvon, it is applied by dipping at normal room temperatures. The basic coating is susceptible to various dye colors. It can be applied either to complete assemblies, parts, or to galvanized sheet previous to fabrication.

Synthetic Resin Finish

A SYNTHETIC resin base wrinkle finish composition that needs no cooking has been announced by *New Wrinkle, Inc.*, Dayton. The material can be applied in any desired textures by spraying, spreading or rolling.

Phosphate Type Finish

A PHOSPHATE type finish for iron and steel has been added to its line of finishes by *Du-Lite Chemical Corp.*, Middletown, Conn. Called Phosteel, the finish when used with an oil dip is said to be satisfactory as a final finish. It is also recommended as a base for organic finishes as the crystalline surface of the microscopically porous coat grips the paint or lacquer, avoiding chipping or peeling.

Rust Inhibiting Oil

A RUST inhibiting oil, Witch Oil, which is said to protect metal stampings after pressing, and while in storage or transit, and to act as a bond for paint or enamel has been announced by *Mitchell-Bradford Laboratories*, Bridgeport, Conn. The oil is said to withstand baking heat up to 250° F.

Plastic Dip Tank

A MELTING tank for ethyl cellulose dip compounds that maintains critical melt with a temperature variation of less than 5°F has been announced by *Phillips Mfg. Co.*, 3401 Touhy Ave., Chicago 45. The unit has a capacity of 15 gal of melted ethyl cellulose or similar compounds. The melting tank is encased in an oil bath by which heat is transmitted throughout the melt uniformly by convection. Thermostatic controls are said to keep the melt at exactly the temperature desired and there is a separate, screened off section for adding additional unmelted ethyl cellulose so that it does not enter the melt until it, too, is of the right consistency.

Plastic Dyeing Compound

A POWDER dye now available in liquid form for coloring plastics has been announced by *Krieger Color & Chemical Co.*, 6135 Santa Monica Blvd., Hollywood 38, Calif. The dyes are used in water heated to 200° F., approximately 1 gal. of concentrate making between 8 and 10½ gal of die solution. It is being used in fabrication, molding and other types of plastic production in dyeing Lucite, Plexiglass, polyvinyl chloride, acetate and other plastic materials.

Color Glue

FOR laminating or bonding plastics and color together, a color glue, Kriege-O-Dip, has been announced by *Krieger Color & Chemical Co.*, 6531 Santa Monica Blvd., Hollywood 38, Calif. The glue can be used for painting the surfaces of lucite, plexiglas and cellulose acetate. It is also used where a simulated shell effect on handles of plastic compacts is desired. The brown color glue can be painted over the surface of the plastic giving more pressure in certain areas and less in others. The glue is available in red, blue, yellow, orange, brown, black and green. The colors are intermixable enabling the user to obtain an unlimited number of colors and shades.

Pickling Agent

A PICKLING agent for removing rust, scale, tarnish and incrustations of cement and lime from metals has been announced by *Waverly Petroleum* Products Co., Drexel Bldg., Philadelphia. Called Troxide, it is a dry inert compound and is non-eruptive and non-inflammable. It can be used either dry or cold. *Foster D. Snell, Inc.*, Brooklyn, and *Johnson-March Corp. Laboratories*, New York, developed it.

Material Pump

AN air-operated high pressure pump for dispensing and applying paints, lacquers, mastic, sealers, insulating materials, etc., has been announced by *Stewart-Warner Corp.*, 1826 Diversey Parkway, Chicago,

Materials are fed at a uniform rate even to outlets located several hundred feet from the pumping source. This is particularly vital in spray jobs where speed and uniformity of application is essential. "Versatal" pumps will handle one to six outlets or spray heads. Materials handled are constantly circulated and kept well mixed without the use of a mechanical agitator.

Carbon Filament Lamps

NALCO carbon filament lamps supplied with a mechanical joint between the base and bulb to provide a permanent seal under all circumstances, has been announced by *North American Electric Lamp Co.* It is said that the method of mechanically locking the base to the bulb employed, eliminates the need for cements or other binders. The clear type lamp is furnished with the mechanical base in 128, 250, 375 and 500 w. The inside R-40 lamps with mechanical base are available in 128, 250 and 375 w.

Pickling Inhibitor

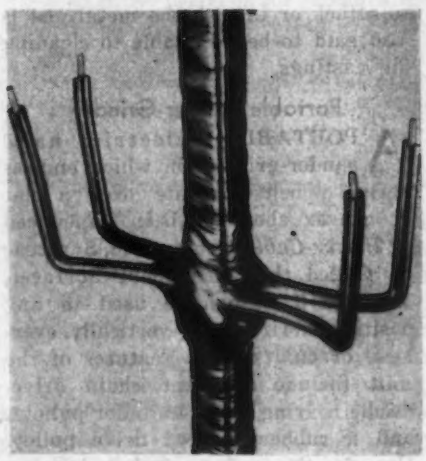
A CONTROLLED pickling inhibitor which is said to save acid by causing the acid to work on the scale only, has been announced by *Kelite Products, Inc.*, Los Angeles. It is claimed to reduce the possibility of hydrogen embrittlement. Called Kelite Control, it is a reddish brown liquid, soluble in either sulphuric or muriatic acid. It is packaged in 5-gal cans and 15 and 55-gal drums.

Detergent Wetting Agent

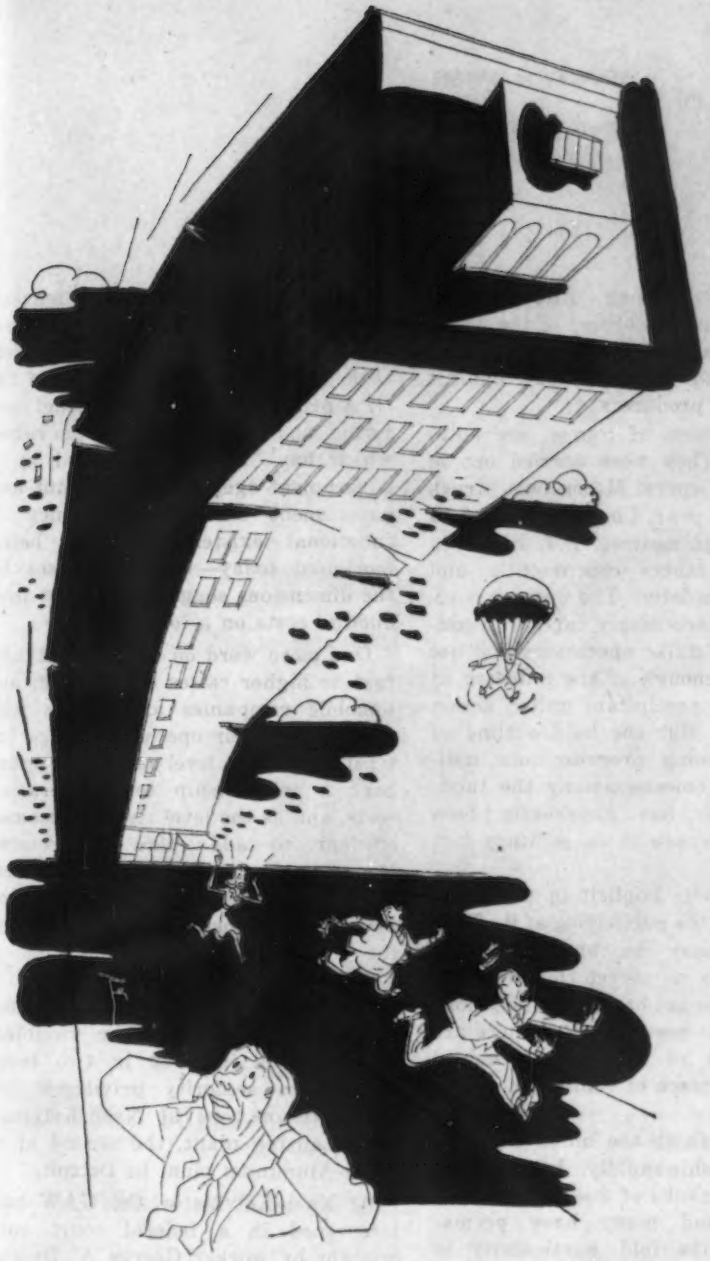
A DETERGENT that is said to leave no surface films or streaks has been announced by *Standard Scientific Supply Corp.*, 34 West 4th Street, New York 12. Rinsing is said to leave the surface sparkling clean. The action of Alconox is based on physical action in lowering the surface tension of foreign matter adhering to the surface to be cleaned. It gets between the dirt and the surface, completely removing grease, grime and dirt, yet is said to have no effect on the base material. Alconox is claimed to be equally effective in water of varying degrees of hardness and even in acid solution.

Insulator

FOR the insulation of plating racks, Miccrotube has been announced by *Michigan Chrome and Chemical Co.*, 6340 E. Jefferson Ave., Detroit 7. It is an extruded tubing made from a tough, elastic plastic base material that is said to have exceptional resistance to plating baths



and cleaning solutions. It is claimed to withstand hot plating solutions, including 180 to 190° copper and practically all types of boiling cleaning solutions without damage or deterioration. It is not recommended for use in trichlorethylene, however. The surface of Miccrotube is said to be smooth and glossy so as to permit solutions to drain from the racks more quickly. It is usually used in combination with Miccrotape. The contact wires of the rack are covered with Miccrotube and the spline is wrapped with Miccrotape. The two materials are then fused by heating into a continuous homogeneous coating. Miccrotube is available with inside diameters ranging from 1/16 in. to 1 in.



you wouldn't

Nor would you put carbide cutting tools on a lathe lacking the fundamental rigidity for their use. Carbide tools have increased cutting speeds from 200 to 500 per cent. They require as much as 300 per cent more horsepower.

Modern Jones & Lamson Turret Lathes are designed specifically to carry this extra load, and more. They have the rigidity, they can transmit the power, they are easy to operate.

THE KEEN COMPETITION TO COME will make us all more cost-conscious than ever. Our jobs, and our earnings, as well as profits, will depend upon maximum production from the most efficient machines.

Now is the time to check your equipment. Plan now to scrap obsolete machines and replace them with good War Surplus machines or new machines. Our engineers will be glad to assist you.

What HORSEPOWER Are You Using?

This cut, on 2-inch bar stock, requires 300 per cent more horsepower with a carbide tipped tool than with a high speed steel tool, and Carbide halves the cutting time.

Engineered to "Carry the Load" for Most Productive Operation With Carbide Cutting Tools

JONES & LAMSON
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Turret Lathes

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

Assembly Line . . .

STANLEY H. BRAMS

• Auto Union plans a strike in all General Motors plants as first step in its campaign to obtain a 30 pct advance in wages . . . Outline of program may be a sign of weakness . . . Other labor troubles multiply.

DETROIT—The long-anticipated knockdown battle between labor and management in the automobile industry began to come to a head last week, with storm warnings at a half-dozen points overshadowed by decisive moves by the CIO United Auto Workers Union in the General Motors sector.

The UAW revealed plans for an industrywide 30 pct pay raise demand which, if unsuccessful, would be followed by isolation of one company at a time, concurrent with all possible aid to its competition. General Motors was singled out as Victim No. 1, with Chrysler and Ford scheduled next in line.

Strike votes will be called for in all automotive plants. The union holds little hope for an industry-wide conference on wages, nothing of the sort having panned out before. But the call for such a conference will be made, and if it is rejected the pressure will then be mounted against General Motors.

The program calls for a walkout in all departments of General Motors throughout the country. At the same time, the union will take careful pains to try to see that no labor difficulties of any sort interfere with operations of other automobile concerns. The idea is to paralyze G.M. during the reconversion period when the pressure will be greatest on it to get back into operations and maintain its competitive position.

The blueprint then outlines similar action against the others of the major three companies. After that the onslaught would be continued against the smaller producers.

These tactics, of course, are nothing new. They were carried out in 1937 when General Motors was struck early in the year, Chrysler as soon as the campaign against G.M. had been completed, others concurrently and most of them later. The union has always been exceedingly careful to concentrate its strike operations and not shut down enough of the industry at one time to precipitate united action against it. But the bald outline of the forthcoming program now indicates that someone among the tactical generals has apparently been studying Clausewitz on military tactics.

Confidence is implicit in the union position and the publicizing of it. That confidence may be understandable, because it is no secret that all auto firms want to get back into operations as rapidly as possible. But there are major signs of weakness combined with the displace of confidence.

FOR one thing the union is losing membership rapidly. Layoffs have reduced the ranks of dues payers considerably, and many have permanently left the fold, particularly in the aircraft plants. The million-plus membership of UAW is probably down below a half million dues payers today. The public announcement of the UAW battle plan was largely intended to bolster the spirits of the dues payers and the non-dues payers.

Further, any large-scale strike such as outlined by UAW would bring a sharp outburst of public opinion against it at this time. The country faces a prospect of some 7,000,000 unemployed during the coming months. A General Motors strike would affect not only some 300,000 employees directly involved, but twice that many others in supplier plants. Another million idle men might bring government reaction together with the inevitable public reaction.

And G.M. might be willing to meet the challenge head-on and make a long fight out of it. In 1937 its strike lasted some 47 days in the midst of an active and competitive market. The company could go the distance again. It might have no choice but to do so, because the provisions of the OPA price formula in 1946 model cars forbid any increase for wage raises which have not been ordered by a government agency; and without any government enforcement agency in functional existence — WLB being moribund today—wage increases of the dimensions sought would put production costs on a loss basis.

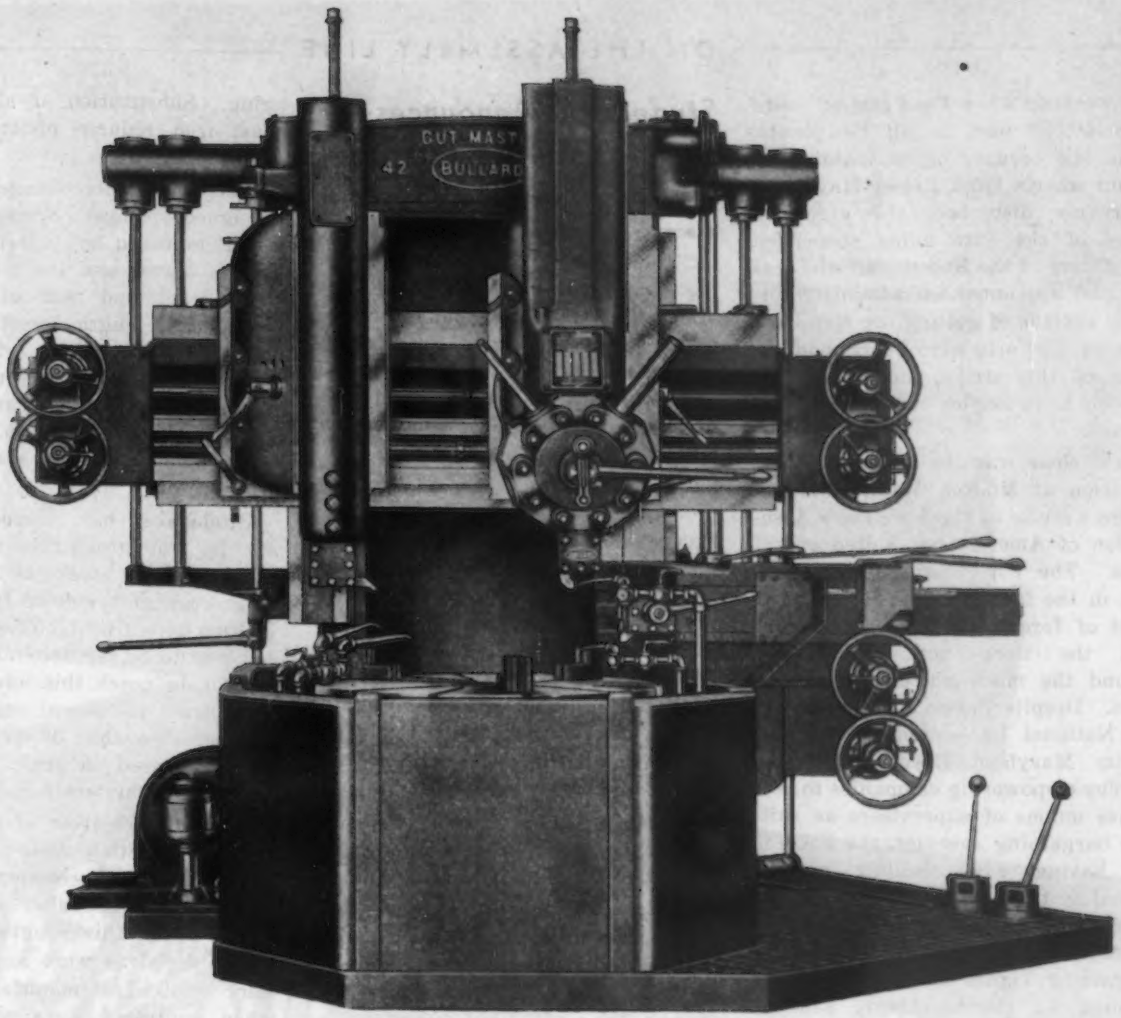
One more word on this subject: As fast as higher raises come along, automobile companies and others will simply tool their operations more intensively. The level of wages must bear a relationship to comparative costs, and as the level rises it becomes efficient to add more progressive operation machines. If today's union wage policy is carried out, it automatically becomes a policy to reduce the number of available jobs.

IN another manifestation of autodom's increasing labor troubles, the union is involved in two tests of veteran seniority privileges for war veterans, one at Nash-Kelvinator's Lansing plant, the second at a Bohn Aluminum plant in Detroit.

At Nash-Kelvinator, the UAW has intervened in a federal court suit brought by worker George A. Droste against the company, which charges that the Selective Service Act gave him seniority over non-veterans and that the company has not followed the mandates of the legislation. The union brief of intervention said this position, if approved by the court, would impair the rights of unionists, both those who went to war and those who remained home, and would destroy seniority patterns on which job security is based.

At Bohn Plant No. 1 the veterans' issue was raised when the company recalled some 50 men after recent reconversion layoffs, giving preference to former service men under its interpretation of the Selective Service Act. The UAW contended that stewards had to be returned to work first, and began a strike.

Meanwhile, the effects of the three-week-old Kelsey-Hayes Wheel Co. strike blossomed out into full flower



ONLY BULLARD CUT MASTERS HAVE ALL THESE COST-CUTTING FEATURES

Features that Cut Time on Cuts

1. On five sizes, 30" up to and including 64", the base and upright column is a massive integral casting for vibration-free sturdiness and rigidity. This permits heavy, accurate cutting. **2.** Swiveling main turret head and independent, non-swiveling side head for simultaneous heavy cutting without interference or lost time. **3.** Sixteen feeds for each head in geometrical progression from .0026 to .500 per spindle revolution . . . 20 table speeds . . . motor ratings 30 to 40 HP — *all* adequate for fast heavy cutting. **4.** Screw feed of main head for highest degree of machining accuracy under heavy feeds. **5.** The ideal combination of rigidity, sturdiness, freedom from vibration, smooth flow of power and wide range of speeds and feeds to take full advantage of the higher efficiency of the latest development in cutting tools.

Features that Cut Time between Cuts

6. Vertical construction that speeds chucking because it is easier to lay a piece down than to hang it up. **7.** Chucks designed to provide maximum jaw pressure with minimum wrench effort. **8.** Quick, easy adjustment of main rail to place turret close to work and eliminate excessive tool overhang. **9.** Rapid power traverse in any direction, accurately controlled to bring tools quickly, safely within a fraction of an inch of the work.

Compare Bullard Cut Master Vertical Turret Lathes' efficiency and economy with other machines of the same type. You'll find that only a Cut Master has the metal-removing ability and *all* the other features that *cut time on and between cuts* to the minimum. Cut Masters are available in 30", 36", 42", 54", 64", and 74" sizes. The Bullard Company, Bridgeport 2, Connecticut.

From Government Machine Tool Surplus Lists, select the better machines to replace obsolete models you've been using on non-critical work. Ask Bullard for information on your selection of government surplus machines by machine serial number.

BULLARD

CREATES *NEW METHODS*

TO MAKE MACHINES DO MORE

last weekend when Ford laid off more than 50,000 men in all its plants, made idle because of an inability to obtain wheels from Kelsey-Hayes.

Gravely disturbed, the executive board of the auto union suspended the officers of the Kelsey unit of Local 174 and appointed an administrator, usual prelude of getting the men back to work. Efforts were being made to clear up this strike, thus making it possible to re-employ the laid-off Ford workers.

Less clear was the outcome of the situation at Hudson Motor Car Co., where a strike of the Foremen's Association of America has halted operations. The FAA claims discrimination in the layoff and the re-employment of foremen, a strong inference that the tieup actually revolves around the much-mooted recognition issue. Despite the recent reversal by the National Labor Relations Board of its Maryland Drydock position, thereby empowering companies to recognize unions of supervisors as suitable bargaining agencies, the FAA is still having tough sledding, as evidenced by the inability of its bargaining committee to confer with the Hudson management, its failure to obtain bargaining rights at Packard after winning an election there, and its general lack of recognition throughout the automotive and steel industries, except at Ford and a few other scattered plants.

Studebaker Announces New 1946 Car Models

South Bend, Ind.

• • • **Studebaker Corp.** has announced its 1946 models, featuring new styling, improved riding qualities and other advancements. Four body types in the Champion series, Studebaker's offering in the lowest price field, will be manufactured in 1945, with production schedules promising a sampling of dealers within the next month.

The "Skyway" design offered by Studebaker in its higher priced prewar models, are introduced to the Champion series in the 1946 cars. Body lines are reduced to simple essentials. A bright new grille, with strong horizontal members extending virtually full-width across radiator and fenders, complements the car lines. Rugged bumpers with vertical guards are offered.

Standard specifications include deluxe steering wheels, automatic dome lights in all models, automatic rear compartment lights in 4-door sedans, and bright metal for body sill finishing strips, windshields, and rear and side window moldings. Bedford cloth is used for upholstery.

Aluminum alloy pistons, discarded early in 1942 when that material became scarce, are returned to the engine. Substitution of aluminum for cast iron reduces piston weight by more than half.

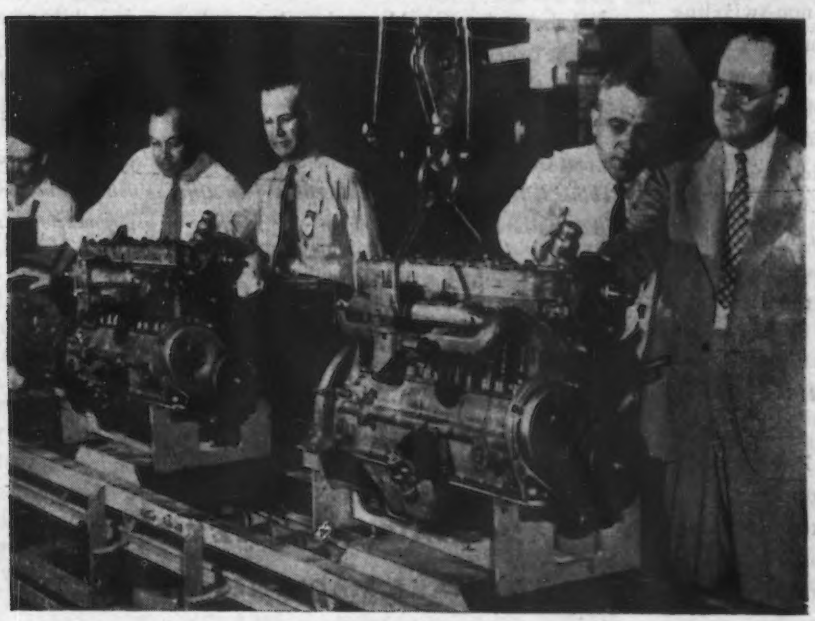
Among chassis changes are newly designed springs. Spring action has been improved by tapering the ends of the leaves and the introducing at both front and rear of oil-impregnated full length inserts known as Flex-o-liners. These, designed by Studebaker, tend to reduce interleaf friction, it is claimed, and to assure smooth soft spring action. Shot peening is continued for all the spring leaves.

Studebaker has cleared the decks for its war production by appraisal of all military stocks in its plant and in process, and removal from the production departments. The company is believed to be the first large war contractor to reach this advanced stage in contract settlement negotiations. It has been less than 30 days since production ceased on heavy duty trucks and weasel carriers.

The quick clearout of the plants is credited by Studebaker people to the pretermination agreement system developed by Studebaker about a year ago. Under this program predetermined decisions were made on every item involved in manufacturing, and when contracts were actually cancelled out it required only an actual count of work in process to activate the agreement. The Chicago Ordnance districts verified this inventory three days after it was completed, with the result that all productive departments have been cleared and some 50 carloads of freight and 45 truckloads of material have already left the plant.

Remaining work on contract terminations is said to be largely clerical, and paper work is progressing so rapidly that it is expected to be wound up within 90 days after contract termination.

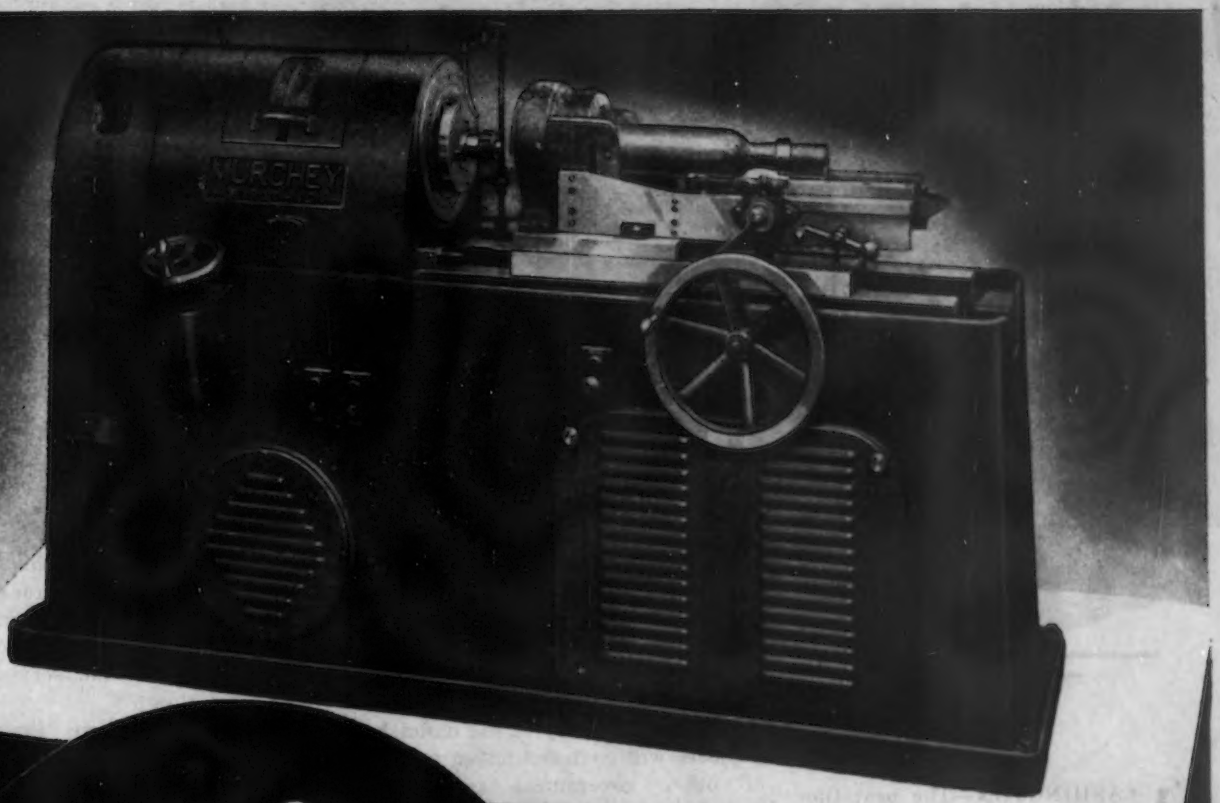
NEW OLDS ENGINE: *A new assembly line in the motor plant of the Oldsmobile division at Lansing is now operating, and the first of the* 1946 *engines is being examined by R. A. Fishel, motor plant superintendent; E. J. Martin, general foreman; John Dykstra, manufacturing manager; and D. E. Ralston, general sales manager.*



Ford to Build New Type Car

Detroit

• • • **Ford Motor Co.** will shortly go into production on a new type of passenger car, a sportsman's convertible, combining the wooden body of the station wagon with the convertible top and close-coupled seating of a convertible coupe. The wooden panels are applied over a steel frame. A power-operated top is specified. Limited production will begin soon after the public announcement of the 1946 Ford.



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Built and geared for mass production of right or left hand internal or external threads 1" in diameter up to 4" O.D. inclusive and up to 6" I.D. depending on the contour of the piece. 3" long up to ½" pitch and covering full length of thread through annular milling cutters. Completely hydraulic work cycle and a variable speed drive permits the selection of the right speed and feed for each job. Write for complete catalogue to Dept. I.

MURCHEY MACHINE & TOOL CO.
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Murchey also manufactures all types of Collapsible Taps, Self Opening Die Heads and Shell Tapping Machines. Write for literature on any or all of these products.

MURCHEY

Washington . . . L. W. MOFFETT

• Commerce Dept. may take over WPB Advisory Committees . . . Some unfinished research contracts to continue under government agencies or private industry.

WASHINGTON—The peacetime counterparts of WPB Industry Advisory Committees may be unveiled in the near future unless some topside Office of War Mobilization and Reconversion officials prevail in their opinion that the committees have outlived their usefulness except for reconversion activities and, therefore, have no logical place in our peacetime economy.

Those advocating continuance of a limited number of the more important committees are practically unanimous in the opinion that the Dept. of Commerce will be the best place for these groups to function. This is particularly true in view of the likely step-up in that Dept.'s activities. Plans have reportedly been laid to transfer the Smaller War Plants Corp. to Commerce and install the chairman as an assistant secretary. The number of committees which may be involved in the transfer will not exceed 50 at the most, and will undoubtedly include the Steel Industry Advisory Committee.

Throughout the war, Industry Advisory Committees have proved to be an invaluable source of cooperation and guidance in conducting WPB programs and in the ultimate solution of war production problems. They served in an advisory capacity and had no hand in direct policy determinations. They were convened to advise WPB on problems resulting from the issuance and revision of WPB orders and changes or failure to meet established production schedules. They provided a channel for the exchange of information between government and industry—one of the functions which, it is said, would prove similarly useful in the years to come.

In all there were 1009 committees, of which 773 were active at the end of 1944. During last year around 1300 formal meetings were held, in addition to 83 special gatherings. Representatives from small, medium-size and larger companies attended these meetings which were presided over by WPB officials and summaries of activities were prepared and furnished industry for informational purposes.

* * *

While most of the 284 research contracts sponsored by WPB's office of Production Research and Development will be terminated by the end of the calendar year, many of the unfinished projects will continue under auspices of other government agencies or private industry, the Board has announced. It is not known yet what specific investigations will be continued but among those that are expected to go forward are some of the researches of the Metals and Minerals and Industrial Processes Branches.

Researches under the Metals and Minerals Branch included investigations on increasing blast furnace capacity; a study of standard methods of spectrographic analysis; the development of a coated wire wound resister; a project to develop fluoroscopic inspection of metals; work to improve the quality of magnesium alloy castings, particularly for aircraft; tests for classifying scrap metals; and 42 other projects. The Industrial Processes Branch was in charge of metal milling and engineering researches; the wood lamination project; the production of waterproof materials; spot welding and flash welding studies; development of high-grade water repellents for wood and processes to increase wood resistance to decay, molds and insects; and others.

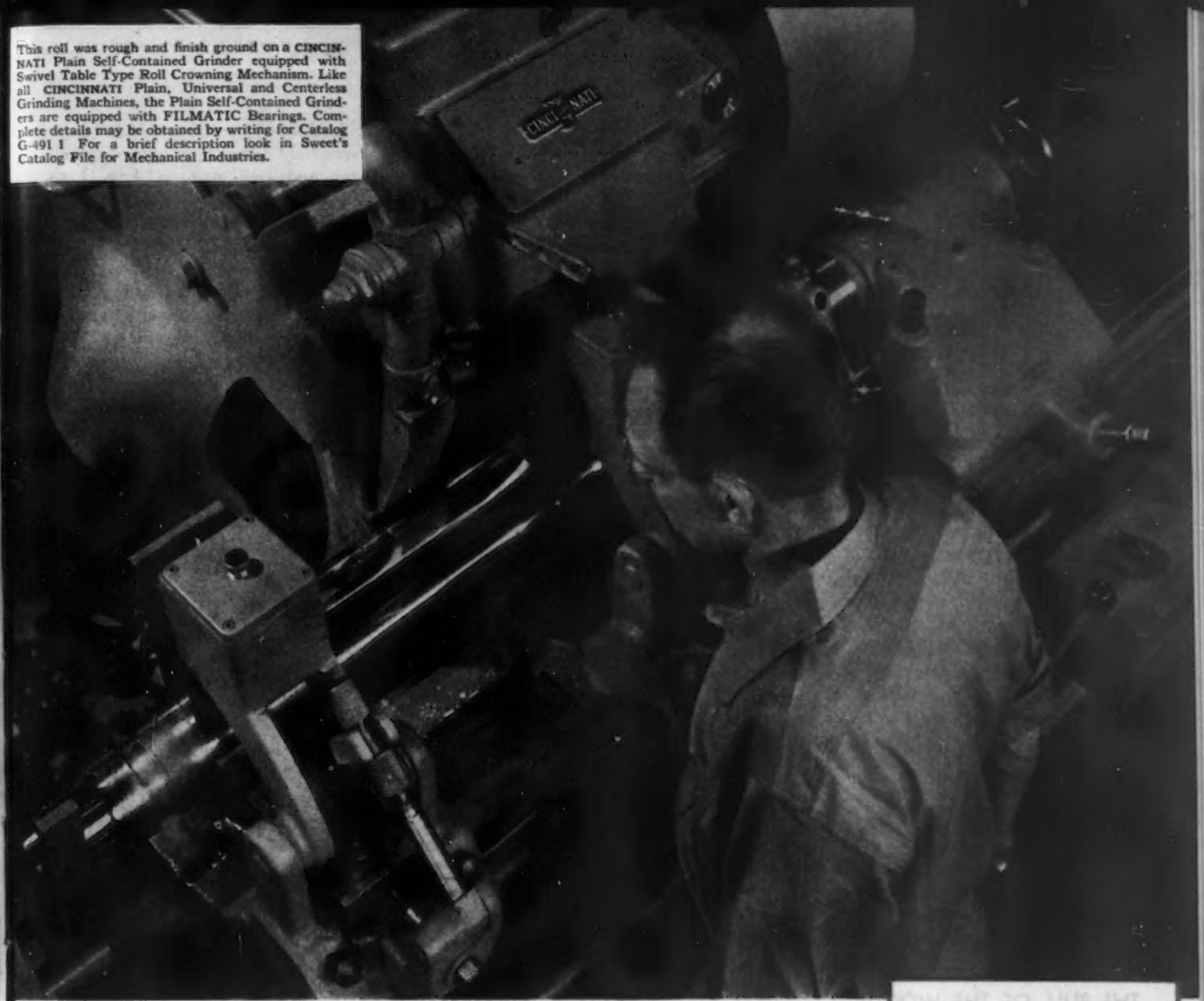
* * *

Steel mill products are among the groups of commodities that will continue to require individual licenses for export. Other items in this category are lead, tin, brass and bronze manufactures, electrical industrial machinery and equipment, automobiles, parts, accessories and service equipment.

Retention of these lines under licensing was announced by FEA recently when it disclosed a cutback on export controls of approximately 80 pct of those commodities that formerly required licenses for export. Those still restricted for export, FEA said, are in tight supply, needed for defense purposes, necessary for reconversion and needed to fill prior United States commitments.

The relaxation of export controls, FEA said, does not in any way affect the import requirements of various foreign countries. A number of liberated governments still retain restrictions upon export trade through commercial standards. Until private trade is restored within these areas, FEA said that it cannot consider export license applications for shipments to these destinations.

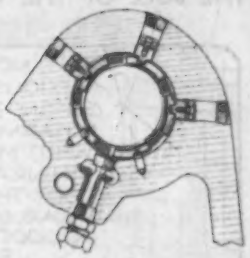
TRANSOCEAN TRANSPORT—*Douglas C-74 Globemaster, military cargo version of the DC-7, the first transocean transport plane, capable of flying nonstop more than 7500 miles. Speed is in excess of 300 mph; weight 77 tons; load capacity 30 tons.*



This roll was rough and finish ground on a CINCINNATI Plain Self-Contained Grinder equipped with Swivel Table Type Roll Crowning Mechanism. Like all CINCINNATI Plain, Universal and Centerless Grinding Machines, the Plain Self-Contained Grinders are equipped with FILMATIC Bearings. Complete details may be obtained by writing for Catalog G-491 1 For a brief description look in Sweet's Catalog File for Mechanical Industries.

No Pampering of FILMATIC Bearings To Get Fine Finishes!

Ask any grinding man about the problems involved in roughing and finishing on the same machine. The chances are he will tell you that no problem exists if the grinder is a CINCINNATI with FILMATIC Bearings. But other types of grinding wheel spindle bearings usually involve a careful readjustment by an experienced man. With the introduction of FILMATICS, adjustment was eliminated, for you don't have to treat these bearings with kid gloves. Heavy roughing or fine finish grinding is all the same to CINCINNATI Grinders equipped with FILMATIC Bearings, for they require no adjustment whatever. These bearings are next to foolproof and demand no attention except periodic change of spindle oil. ¶ The fact that you don't need to pamper FILMATIC Bearings, regardless of the grade of finish desired, is still another reason why you should choose CINCINNATIS for your centerless or centertype grinding and lapping operations. Booklet G-446 contains the complete story. Write for your copy.



THE FILMATIC PRINCIPLE. *Self-adjusting shoes produce independent, converging oil films which develop high radial pressures, forcing spindle into central position and keeping it there "The wedge-shaped oil film does the trick."*

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Issues Directive 77 To CMP Regulation 1

Washington

• • • Manufacturers are not required to return CMP tickets covering allotments of materials no longer needed, WPB announced recently. This action merely eliminates the paper work involved in notifying WPB and does not revoke or modify the rule that unneeded third quarter allotments must be canceled, WPB pointed out.

This action was taken through the issuance of Directive 77 to CMP Regulation 1, which supersedes contrary provisions in paragraphs (e), (u), (w) and Interpretation 31 of that regulation, WPB said.

At the tame time, it was announced that a statement of manpower requirements (Form WPB 3820) is no longer required in making appeals from WPB orders, regulations or administration. Priorities Regulation 16, appeals procedure, has been amended accordingly, WPB said.

•

Diamond Controls Relaxed

Washington

• • • Distribution controls over industrial diamonds have been relaxed by WPB by an amendment to M-109. Henceforth the board will exercise controls only over monthly sales of industrial diamonds in the amount of 1000 carats or more and diamond powder (crushing bort) in the amount of 250 carats or more. Formerly distributive controls were maintained over monthly sales of industrial diamonds totaling 100 carats and crushing borts of 25 carats.

WPB said that inasmuch as parallel controls over industrial diamonds are in effect in Great Britain, a similar relaxation may be expected in that country.

WPB also revoked supplement 1 to M-109 which listed the factors involved in determining the denial or granting of authorizations required by that order.

•

WPB Reports Zinc Stocks

Washington

• • • WPB has announced that government stockpiles of slab zinc totaling 187,200 tons on July 1 will be available in part to supply deficiencies in zinc production for reconversion needs during the next six months. Industry inventories of slab zinc on that date amounted to 121,900 tons. The government stockpile showed a sharp shrinkage from 247,300 tons on Jan. 1 while industry holdings rose from 104,400 tons. Government stocks of zinc concentrates and slab zinc on Aug. 1 totaled 314,500 tons while industry stocks aggregated 178,200 tons, comparing respectively with 300,400 tons and 157,900 tons on Jan. 1.

Barring any sharply increased reconversion demands over previous peacetime needs, WPB officials indicated they did not expect that the government stockpile would be needed to any great extent during the next six months. This conclusion was based on estimates of previous peacetime production compared with present production. In 1940, the most recent peacetime year in this country, zinc production amounted to about 675,000 tons, as compared with a current production rate of 840,000 tons.

•

Preference Ratings Halted

Washington

• • • WPB has stopped the use of preference ratings by the military services on behalf of their contractors and subcontractors for construction, machine tools and other equipment. This action, another step to free industry from wartime controls, was taken through amendments to Directive 41. The military services will continue to use the new MM ratings for direct procurements on their own behalf.

•

Chilean Loan Approved

Washington

• • • A $20,000,000 loan by the Export-Import Bank to Chile for the construction of a steel mill has been approved, it was recently announced by Chilean officials. For further details on the steel mill see THE IRON AGE, Sept. 13, p. 109.

The money is also expected to include a vast public works program.

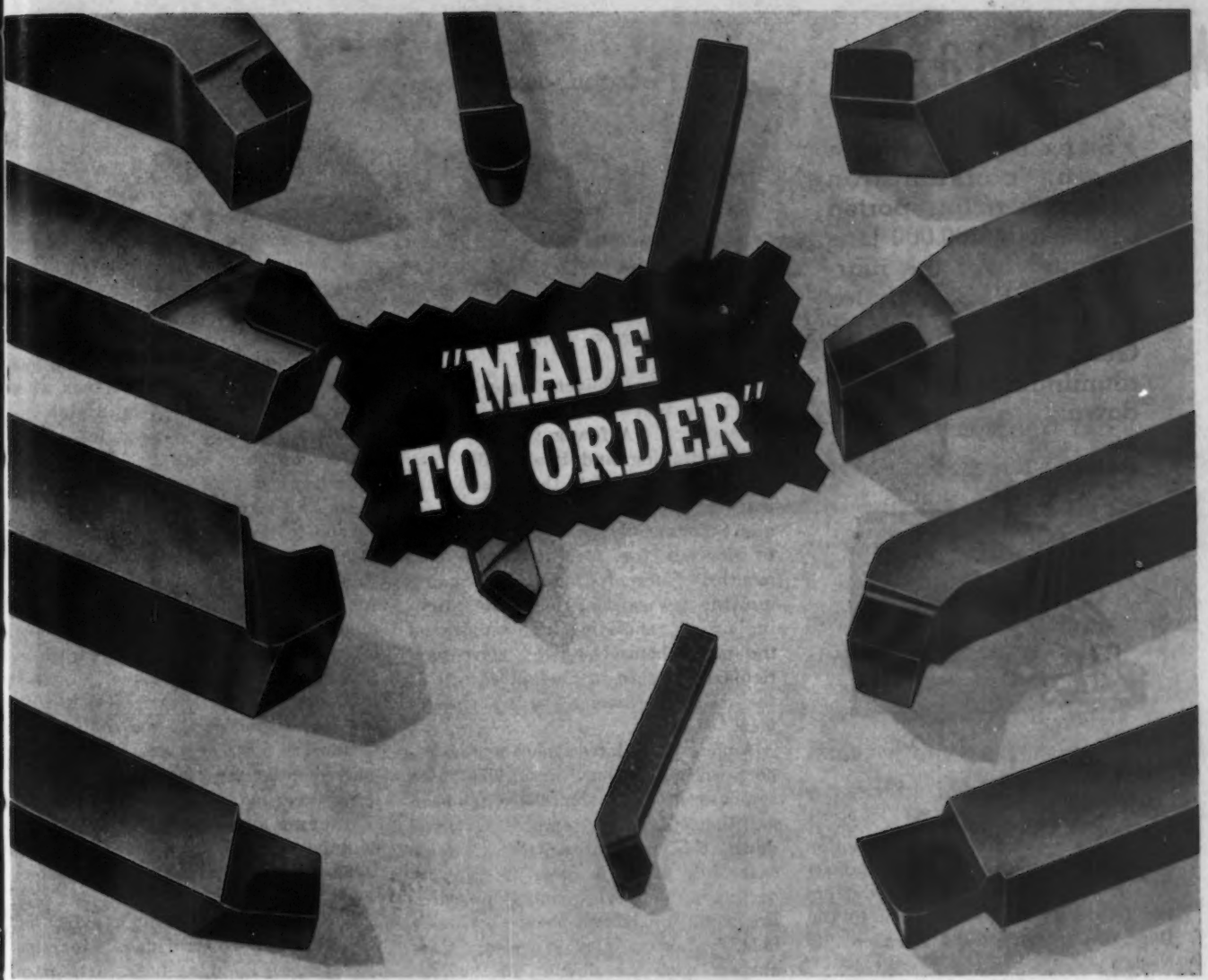
•

Sells Surplus War Plant

Washington

• • • The sale of Government-owned munitions plant located at Plymouth, Mich., and operated during the war by the Kelsey-Hayes Wheel Co., has been made to the Evans Products Co., Detroit, the Surplus Property Div. in Detroit has announced. The Evans Products Co. manufactures a wide variety of automotive parts and accessories.

THE BULL OF THE WOODS — BY J. R. WILLIAMS



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Carboloy "made-to-order" tools are supplied finished ground ready for the job, or "milled and brazed" (complete except for final grinding). When desired, our engineers will be glad to assist you in the design of "specials" that can be made at minimum initial cost, provide for rapid regrinding, and permit maximum use of each Carboloy Blank.

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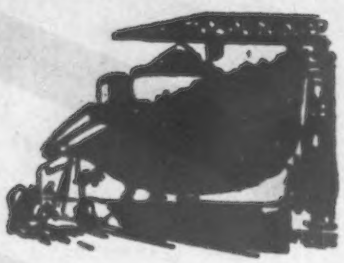
Special Tools SINGLE POINT

West Coast . . .

OSGOOD MURDOCK

• Steel production down, consumption light with an unreported mysterious 400,000 tons hanging over the market . . . RFC reinvites U. S. Steel to bid for Geneva as government aluminum plants close down.



SAN FRANCISCO — Jurisdiction over Pacific Coast industrial activity is being transferred from the Dept. of Utter Confusion to the Dept. of Contradiction & Paradox this week.

Local steel mills report a decline in their operating rate, heavy demand and low consumption. Bethlehem, from the Northwest to southern California, needs men in both the skilled and unskilled categories, as does Columbia; a condition which is holding back production in both companies. Plant managers are puzzled as to what has become of the good steel men who do not generally hop from job to job looking for the highest pay; no one seems to know what has become of them. In the unskilled classification it is pretty well recognized that many have "gone with the tools" in other trades for higher wages, so it may take time for the common-labor category to reconcile itself to working for wages as opposed to "putting in the hours" as a mechanic for a higher rate plus overtime.

Demand at the mills is good. Bethlehem's 9-in. mill is booked through February, the 12-in. through November, and the 18-in. through December. At Fontana, plate demand is naturally light, with October quoted on 3/16-in. and this month on 5/16-in. and heavier. Structurals are ordered through November, bars through December and semi-finished through October. Geneva has orders for plates booked into October, but if another order came in over the transom it could probably be delivered by air-express tomorrow—according to one official.

While these delivery dates are in effect, actual consumption is extremely low. A few government jobs are continuing and two small Navy jobs are being let this week, but neither public nor private work of any substantial tonnage is expected to develop for more than several months. Current production is going into the few existing jobs, into catching up on rebuilding and repairs on the mills themselves, and more particularly into restocking inventory at the mill and among the warehousemen.

Among these latter there are no reports of actual hardship. The most typical reaction is that there has been a "slackening in tempo." Pinned down, this translates itself in some cases into a rough guess of a 50 pct decline in deliveries, many of which are being filled from stock previously held for orders now canceled. Concurrent with the slow-up in the jobbing trade a series of expansions are taking place.

Everett Grant and Robert Ross of Ryerson Steel & Iron Corp., recently completed a coastwide inspection trip during which, it is reported, they bought a site in Los Angeles for a new Coast warehouse and took an option in Oakland for another, which would add two new outlets to the Pacific Coast steel warehouse industry. At the same time Earle M. Jorgensen plans to double the size of their warehouse; Taylor & Spotswood have punctured through several of their buildings to increase their capacity; Gilmore Steel & Supply recently added two new bays; and George R. Bormann Co. has almost doubled the size of its plant with two more bays. Taking a look at this flurry of activity J. Philip Murphy counted up the total number of customers on the Coast again and canceled plans for a new warehouse in Oakland, merging with Judson-Pacific instead.

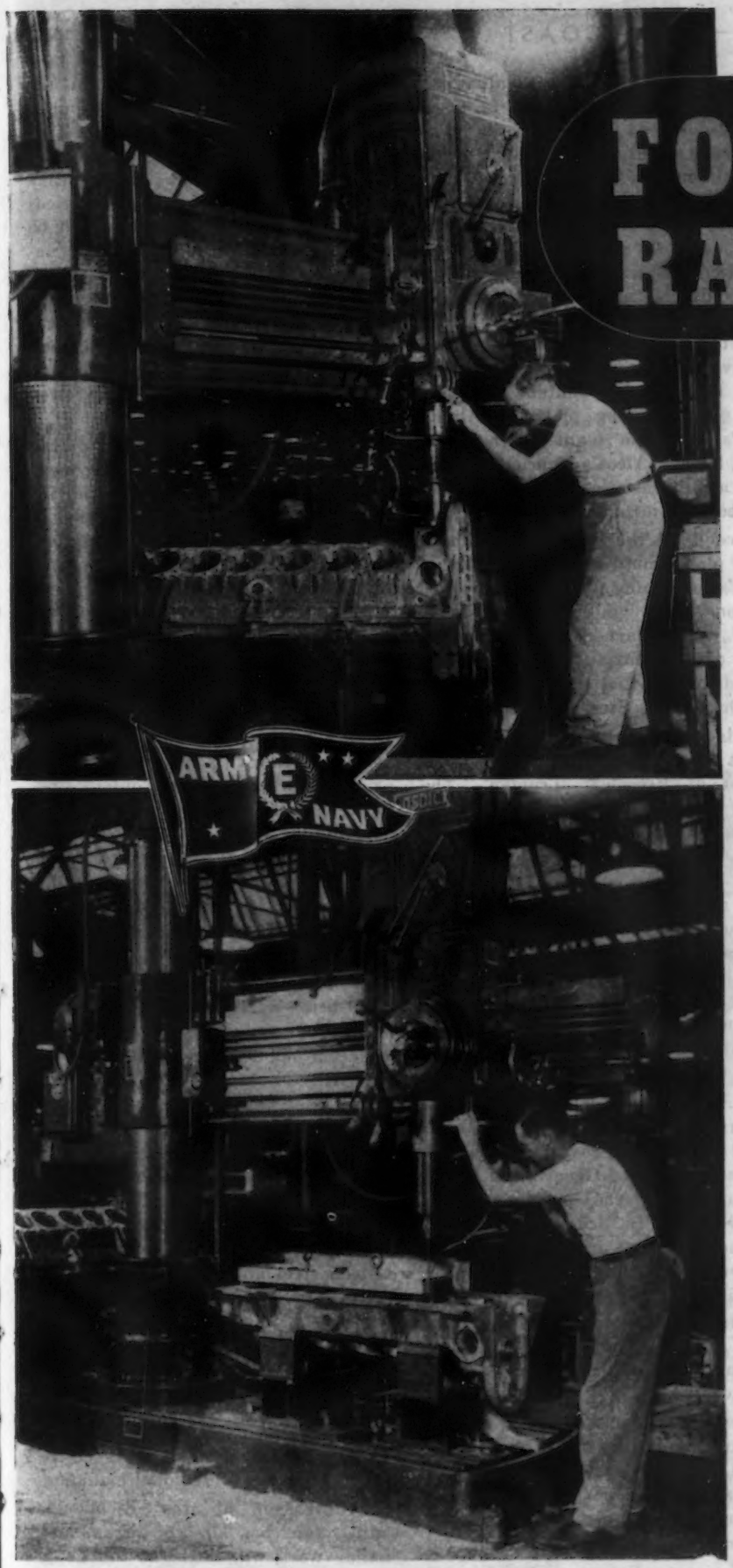
Despite the apparent signs of optimism in some jobber quarters, others with long memories remember that the Navy is still occupying Bethlehem's mill supply depot and recall that U. S. Steel had just completed its new depot when the war broke and the Army Medical Corps moved in before the Columbia had a chance to start operations. These long-memoried individuals realize that mill supply depots only sell in carload lots on the Coast, but if a customer were caught short on a small lot he shouldn't be allowed to suffer.

To date the military authorities have given no indication as to when these two latter facilities may be returned to their owners, but with service discharges mounting daily some talk is cropping out about the need for more jobs in a few months, which might lead to an earlier return than is now contemplated. Meanwhile, conservative warehousemen, partially influenced by their satisfaction with the status quo, aren't too sold on the optimistic postwar consumption estimates—declaring that they haven't discovered too many new customers.

Hanging over this nebulous and undoubtedly transitory situation is a Damoclean 400,000 tons of steel largely unreported.

The local Surplus Property Div. of the RFC has 535 carloads of plates and structurals on its books at a price well under the market. A good deal of it is in bastard sizes, some being 9 x 4 in. angles and ⅜, ½ and ⅝-in. plates. Offering price was first set at $2.70 until a certain degree of heat was turned on the department and the price raised to $2.90. Normal mill price for the stock is supposed to be $3.35 or $3.60 counting Navy extra which is now obviously superfluous. This steel has been offered to a list of 53 export houses, 17 of which are trying to move it in foreign markets, including China, the Philippines, Dutch East Indies and South Africa. While some local steel men wish it could be dumped in the ocean, it is hoped that the plates may be used in rebuilding foreign oil fields and storage depots. If it isn't, they are inclined to think it may become as much of a problem as disposition of surplus atomic and poison gas bombs.

Even more interesting, however, is the secret and confidential volume of unreported surplus, which in four local shipyards alone is said to total 100,000 tons. One yard which contemplated going into the repair business is reported to have had some difficulty with inventory procedure



FOSDICK RADIALS

● The rigid construction of base — column — and arm of the Fosdick Radial enables it to maintain precision requirements on a wide range of drilling — boring — tapping and similar operations.

The centralization of all controls within easy reach of the operator and the hydraulic functioning of important units make for ease of operation and high production.

The record of hundreds of Fosdick Radials on war jobs is ample proof of their ability to meet any new assignments required by reconversion.

One of the Fosdick Radials illustrated is performing a boring operation, the other is drilling the same piece using a jig for locating holes.

If your work calls for a Radial put it on a Fosdick.

For details on construction and design features write for Fosdick Radial Drill Bulletin R I

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ... OHIO

and misplaced 25,000 tons of plates—which is a little like losing a football stadium or a battleship.

A quick check of only a few, not including Maritime Commission yards which have reported nothing, would disclose to anyone interested 67,200 tons of plate, 30,000 tons of shapes and 13,000 tons of bars.

Qualified steel men admit that an estimate of 400,000 tons of surplus stock might err on the conservative side by another six figures if based on an all-product check.

* * *

IF this combination of factors were not sufficient to occupy the time of the statistical division of the Dept. of Contradiction & Paradox, the outlook for California's road construction program should.

The state is supposed to have had a well-rounded program ready for V-J Day bulwarked by a healthy treasury surplus and a long-range plan. It now develops that the supposed $30 million and $90 million sums are not exactly available. There is some question as to the federal government's matching the figures, which may take time, and there is a great deal of opposition to financing the construction out of the state's general fund.

The railroads are particularly interested in this aspect, having anticipated the situation by more than a year, and are understood to have laid—and are continuing to lay—a substantial groundwork of legislative opposition to any such general fund appropriation as would be entailed in a broad road construction program to the tune of a $100 million a year. The alternative is to levy an increased gas tax to finance the project, and while the oil companies are all for bigger and better roads they are completely unenthusiastic—if not downright stubborn—about increasing the gas tax.

An added complication lies in the fact that many of the most pressing road jobs arise from having reached the traffic saturation point. Yet no one wants to rebuild these arteries if they are going to be immediately enlarged. Members of the Associated General Contractors frankly admit that they don't know when the building program will get started or what it will take to start it unless public sentiment overrides private pressure.

* * *

THREE more developments in the western metal industries serve to advance the subject somewhat sideways.

First, the RFC-Alcoa aluminum plant at Troutdale, Ore., is to be closed down, as is the reduction plant at Los Angeles, also operated by the Aluminum Co. Alcoa turned down the RFC for one year's renewal of its lease subject to 60 days' cancellation notice, terming the offer "an impractical operating arrangement." Reynolds Metals, which had also offered to lease the Troutdale plant at half the rental that Alcoa is paying, received no answer from the RFC. The Los Angeles shutdown follows the recent closing of Bohn Aluminum's extrusion plant in the same area, leaving Alcoa's Vancouver plant just about the sole aluminum standard bearer on the Coast.

Second, on the heels of the aluminum plant shutdowns and Columbia Steel's continuing plans for a new $25 million sheet mill at Pittsburg, Calif., W. Stuart Symington, chairman of the Surplus War Property Board, has invited U. S. Steel to bid for the Geneva Steel Co. facilities.

This move is understood on the Coast to have been made at the direct behest of President Truman. The letter of invitation from Mr. Symington to Benjamin Fairless of U. S. Steel, suggests a four-way conference with Sam Husbands, president of DPC and, as a director of the Anglo-California National Bank, familiar with and unprejudiced about Coast industrial problems, and Tom Clark, under whose predecessor was issued the "monopolistic" report, which precipitated U. S. Steel's withdrawal from the Geneva picture.

Mr. Symington's letter said that in his first press conference he had been asked if he would favor local capital in the purchase of Geneva and in accordance with the policies recommended in the Baruch-Hancock report he had answered in the affirmative, whereupon, according to the letter, "I was asked if that meant Mr. Kaiser would be preferred as purchaser over U. S. Steel. I said 'not at all,' that it would depend where Mr. Kaiser got his money."

This development seems to constitute an effective answer to the Biddle-Berge Dept. of Justice report (THE IRON AGE, July 5, p. 102) and the belief that the next move was up to the government (THE IRON AGE, Aug. 30, p. 68).

Third, and directly connected with this next governmental gambit, will come Governor Earl Warren's statement regarding the RFC's refinancing plan for Fontana.

Taking no partisan position on the matter other than that of the public weal, Mr. Warren will announce that so long as the financing of western war plants is such that it is necessary to charge eastern basing-point prices for western produced steel it will be of no benefit to secondary western industry. Mr. Warren is expected to favor continued efforts to rearrange excessive war costs (with an implication which will include Geneva, too) on a basis that will furnish western steel to western fabricators at lower than existing prices.

Col. Alexander Heron, head of the Reconstruction and Reemployment Commission which conducted the inquiry, says that the recent decision of the RFC to sell Geneva to the highest bidder constitutes a constructive move on the part of the federal government which will have a beneficial effect on the entire policy concerning disposal of surplus government war plants.

Other sources close to the governor claim that the forthcoming statement would have been more strongly worded if the RFC had made clearer exactly what part of the Fontana first mortgage represented hypothecated shipbuilding fees.

Now that the disposition of Geneva has been reopened for discussion by the RFC itself, western businessmen are encouraged by remembering public announcements by members of that body of a potential write-down of 80 pct. While mention of this figure is a matter of public record, they wonder what bearing it may have on the RFC Fontana proposal. Mr. Kaiser is admittedly unhappy about it, has not yet accepted the proffered terms, and is understood to be negotiating for a new pricing formula more in accord with the E. G. Budd Mfg. Co. surplus plant purchase, and the anticipated sale price for other eastern steel mills.

•

Date Set for Car Production

Richmond, Calif.

• • • **Ford Motor Co.** will begin production of 1946 passenger cars in November, it was announced by A. S. Hatch, West Coast Regional manager.

Reconversion at the Richmond, Calif., plant has already begun, and similar work will begin at the Long Beach plant immediately, it having been just released by the Army Air Forces. Long Beach will employ approximately 1500 workers by the end of the year and Richmond will need 2000 when it gets into production.

When you design your new products check these advantages of ARMCO Stainless Steels against other materials. Only stainless gives you all 7.

1 CORROSION RESISTANCE

These rustless steels have exceptional resistance to most forms of corrosion in industrial, commercial and household applications.

2 LASTING BEAUTY

Stainless steels retain a smooth, attractive surface. They resist bending, denting and scratching. There is no plating to wear off.

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Since stainless has a high strength/weight ratio, you can use thinner sections of this metal in your products. Stainless steels have ultimate tensile strengths as high as 190,000 psi. in the hard tempers. Yield strengths are as high as 160,000 psi.

4 HIGH HEAT RESISTANCE

Most types of ARMCO Stainless Steels resist heat scaling up to 1600°F. Special heat-resisting grades go up to 2000°F. without destructive scaling.

5 SANITATION

Being easy to clean and keep clean, ARMCO Stainless is highly sanitary. It is unaffected by food acids and will not contaminate foods.

6 DIMENSIONAL STABILITY

Although they expand slightly at high temperatures, stainless steels always return to original dimensions provided external stresses have not exceeded the yield strength of the steel.

7 HIGH CREEP STRENGTH

ARMCO Stainless Steel strongly resists deformation at elevated temperatures over long periods under load.

Only STAINLESS Can Give Your Products *All 7 Sales Advantages*

These are the lasting benefits your customers get from products made of ARMCO Stainless. They mean more sales for you — and more satisfied customers.

Yet sales-appeal is not the only advantage you get from ARMCO Stainless Steels. They are easy to fabricate. They form readily and can be drawn as much as 50% without rupturing. Either gas or electric welding methods may be used.

Write us for more information on specific grades of ARMCO Stainless for your new products. The American Rolling Mill Company, 2801 Curtis Street, Middltown, Ohio.

STAINLESS ARMCO STEEL

A FEW PHYSICAL PROPERTIES OF ARMCO STAINLESS

Armco Grade	Ultimate Tensile Strength, psi.*	Yield Strength psi. (.2%)	Scaling Temp. °F.
17-7 (Type 301)	110,000	40,000	1600
18-8 (Type 302)	90,000	35,000	1650
18-8 (Type 304)	85,000	35,000	1650
20-10 (Type 308)	90,000	35,000	1800
18-12 Mo (Type 316)	85,000	40,000	1650
25-12 (Type 309)	95,000	45,000	2000
18-10 Ti (Type 321)	90,000	35,000	1650
18-10 Cb (Type 347)	90,000	40,000	1650
13 (Type 410)	65,000	35,000	1250
17 (Type 430)	75,000	45,000	1550
27 (Type 446)	80,000	50,000	2000

*ARMCO High Tensile Stainless Steel meets specifications requiring yield strengths as high as 140,000 psi. and tensile strengths up to 185,000 psi. min.

THE AMERICAN ROLLING MILL COMPANY

PERSONALS

PAUL H. FOX, manager, Aluminum Div., Reynolds Metals Co.

• **Paul H. Fox** has been appointed division manager of the Aluminum Div., Reynolds Metals Co., for Wash., Ore., Wyo., Mont. and Idaho, with headquarters in Seattle. Mr. Fox joined Reynolds in 1941 as scheduling supervisor in the company's Listerhill, Ala., rod and structural mill. Last January, he was transferred to Seattle to become manager for the Wash. and Ore. district.

• **O. M. Hullinger** has been appointed manager of the Chicago office of the Elastic Stop Nut Corp. of America, Union, N. J. Mr. Hullinger came to the ESNA Corp. from the Line Material Co., where he was manager of transformer sales.

• **Paul B. Bernhardt** has been appointed western New York representative of the Adjusta-Post Co., Akron, Ohio, with headquarters in Buffalo. He formerly was sales engineer for the Wales-Strippit Corp., North Tonawanda, N. Y.

• **Albert L. Bliss**, supervisor of inventory General Electric Co., Pittsfield, Mass., has retired after 29 years' service. He will become vice-president of the GCA Mfg. Co., Pittsfield, of which he is a director.

• **Robert A. Morris** has been appointed advertising manager of the Acme Steel Co., Chicago. Formerly associated with Chicago and New York advertisers, for the past three and a half years he has been associated with the War Production Board at Washington, most recently as deputy director of the Containers Div.

o o o

• **Peer Nielsen** has been named vice-president and general superintendent in direct charge of operations at the Kaiser Co.'s steel plant at Fontana, Calif. Mr. Nielsen was, until recently, general superintendent of the government-owned steel plant at Geneva, Utah, which has been under the management of a U. S. Steel Corp. subsidiary.

• **David Alwood** has been appointed superintendent of the Wire Drawing Div. of Hanover Wire Cloth Co., Hanover, Pa. Mr. Alwood has been associated with the company for 12 years.

• **Geo. L. Miller**, formerly sales manager, has been named vice-president in charge of sales of the Michigan Steel Tube Products Co., Detroit. **F. W. Sexauer**, formerly assistant sales manager, has been appointed sales manager; **R. O. Berg**, vice-president in charge of research and engineering; **J. C. Thrasher**, vice-president in charge of operations; **Harry J. Longeway**, comptroller and office manager; and **E. C. Hobart**, secretary-treasurer.

• **Alexander M. Wright** has been appointed to the position of assistant general manager, and **Floyd C. Gustafson** to the post of sales manager of the Chandler-Evans Corp., Niles-Bement-Pond subsidiary, West Hartford, Conn.

• **E. M. Cotter**, formerly a merchandising manager with the Crosley Corp., has just been appointed general sales manager of the Norman Young Appliance Co., Dallas.

• **Harold D. Hornbeck** has been named sales promotion manager of Nash Motors Div., Nash-Kelvinator Corp., Detroit. Mr. Hornbeck, who succeeds **N. F. Lawler**, now Nash advertising manager, came to Nash May 1, 1944, after 17 years with General Motors' Chevrolet Motor Div.

• **Carl W. Flesher**, who served as regional head of the Maritime Commission, has resigned to become assistant to the president of Joshua Hendy Iron Works, Sunnyside, Calif.

• **Henry K. Patjens** has been elected president of the Economy Arch Co., St. Louis. Previously he was with Baldwin Locomotive Works.

H. J. FRENCH, assistant manager, Development & Research Div., International Nickel Co., Inc.

• **H. J. French** has resigned as assistant director for raw materials and facilities of the Steel Div., War Production Board, Washington, D. C., and has resumed his duties as assistant manager of the Development & Research Div. of the International Nickel Co., Inc., New York. He leaves Washington after 42 months' service with the WPB.

• **James K. Lamoree** has been made assistant chief engineer of Carnegie-Illinois Steel Corp., Pittsburgh district. He succeeds **Fred H. Johnson** who has been transferred to the Chicago district.

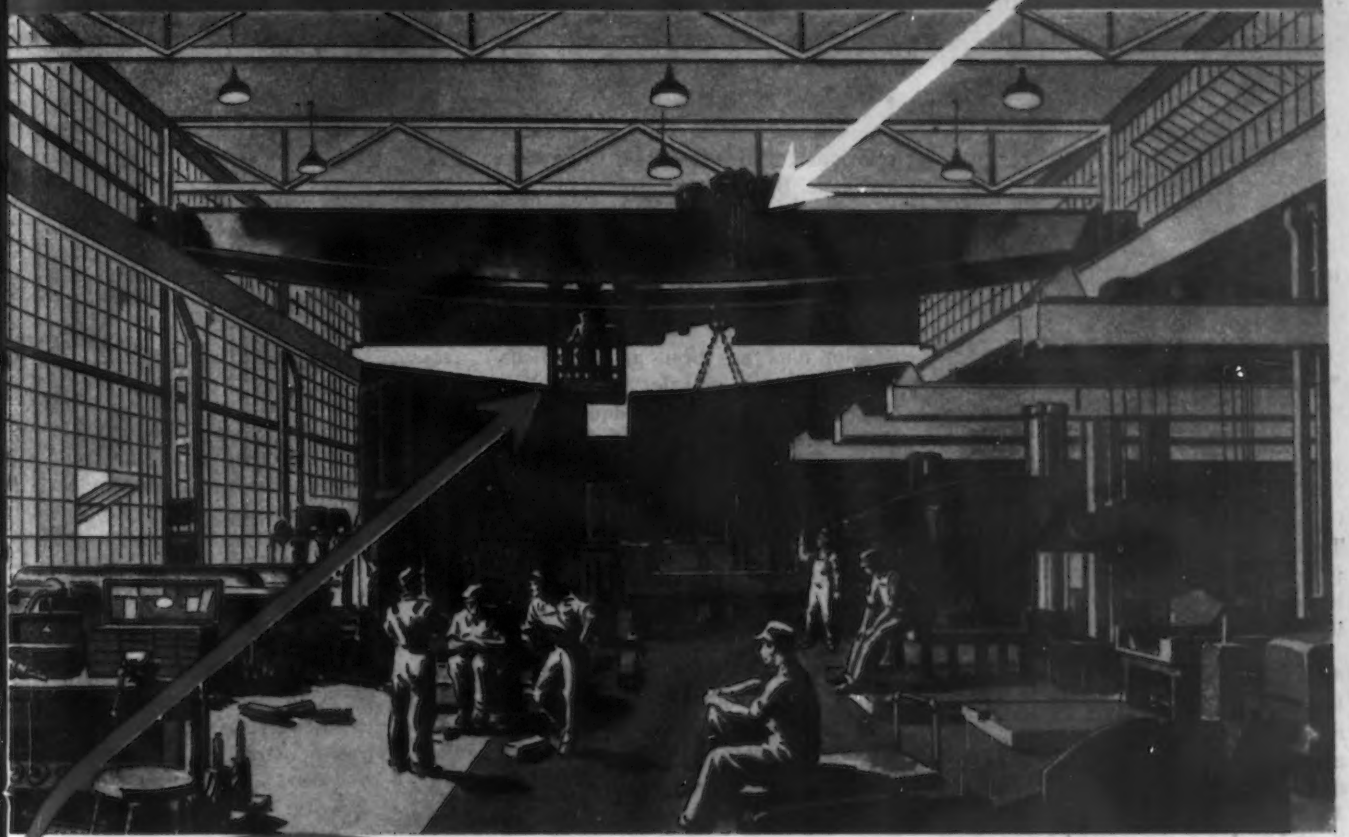
• **Harry G. Howell**, forging specialist and an authority on factory management, is the new vice-president of Tube Turns, Inc., Louisville, in charge of production.

• **Howard F. MacMillin** has become associated with Arthur D. Little, Inc., Cambridge, Mass., industrial research organization. Mr. MacMillin was formerly president and general manager of the Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.

• **William C. Van Cleaf** has been appointed director of industrial relations for the Allis-Chalmers Mfg. Co., Milwaukee. Mr. Van Cleaf joined the company in 1912.

• **Lieut. Col. Malcolm S. Mackay's** release from the Marine Corps will become effective as of Oct. 8, at which time he will resume his former connections as partner of Laidlaw & Co., and a director of American Car & Foundry Co., New York.

WAITING FOR THIS CRANE LOSES LOTS OF MAN HOURS



AN EXTRA Northern CRANE Would Save Them

Maybe they wait only a few minutes—but if they do it many times a day, plenty of man hours are lost—and you pay for them.

Moreover, the whole production schedule is slowed—time is lost everywhere.

An extra Northern Crane on the runway will save all these countless minutes now being lost. Also, if you have an extra crane you need not fear breakdown—it won't tie up your shop.

Investigate the time saving possibilities of an extra crane.

Northern Cranes are fast, powerful, strong, have fine control. They are the fine machine tools of material handling.

Northern ENGINEERING WORKS

General Office: 2607 Atwater St., DETROIT 7, MICH.

NORTHERN CRANE & HOIST WORKS Limited • WINDSOR, CANADA

OFFICES IN PRINCIPAL CITIES

ROBERT A. SHAFFER, president, Coates Steel Co.

• **Robert A. Shaffer,** formerly chief of the Rail Steel Section, WPB Steel Div., has been appointed president of the Coates Steel Co., Brazil. Mr. Shaffer, who before coming to WPB in April, 1942, was connected with the Truscon Steel Co., Youngstown, a Republic Steel Corp. subsidiary, will leave shortly to assume his duties in Rio de Janiero.

• **M. H. Poole** of the Sun Oil Co., Philadelphia, has been made assistant regional manager of the central region of Sun Oil Co. He was formerly manager of the Industrial Div., and **John N. Kerr** has replaced him. Mr. Kerr has for a number of years been district representative for Sun in the Youngstown area and was formerly associated with West Leechburg Steel Co. and Superior Steel Corp.

• **James W. Adams** has been appointed chief engineer in charge of airport development work of McLaughlin-Carr Associates, New York.

• **Claude S. Lawson,** formerly general superintendent of Sloss-Sheffield Steel & Iron Co., Birmingham, has been appointed general manager of the company.

• **R. J. Miedel,** formerly Pacific Coast head of the Hazel Atlas Glass Corp., has been elected president of the Atlas Imperial Diesel Engine Co., Oakland, Calif., to fill the vacancy left by the resignation of **F. H. Kilberry.**

• **Herbert R. Johnston** has been named assistant to R. W. Lindsay, vice-president and general sales manager of Pratt & Lambert, Inc., with headquarters in Buffalo.

• **Walter H. Bodle** has been named assistant to the merchandise sales manager of the Square D Co. with headquarters at Detroit. **Ernest R. Walton** has succeeded Mr. Bodle at Seattle.

• **H. J. Arnot** has been appointed to the post of vice-president in charge of production of Pipe & Tube Products, Inc., Jersey City, New York, and Reading, Pa. Mr. Arnot was formerly plant manager of the company's Reading works.

• **William C. Robinson,** who has been assistant to the director of personnel relations for Lukens Steel Co. and its divisions, By-Products Steel Corp. and Lukenweld, Inc., has been appointed assistant director.

• **N. R. Mehler,** assistant general manager of sales, Sharon Steel Corp., Sharon, Pa., has been appointed district manager of sales of the New York territory, with headquarters in New York City. **T. M. MacBain** has been transferred from the Cleveland territory to the New England district, and will be located in Conn., operating under the New York office.

• **Homer Kirtley** has been named sales engineer of the Agricultural Div., Maremont Automotive Products, Inc., Chicago. Mr. Kirtley has been associated with the Crucible Steel Co. of America in their Agricultural Div. for the past ten years.

OTTO F. SIEDER, vice-president and general manager, H. K. Ferguson Co.

• **Otto F. Sieder,** formerly chief of the Industrial Construction Div. in the office of the chief of engineers of the War Dept., has been named vice-president and general manager of the H. K. Ferguson Co., Cleveland and New York, engineering and construction firm.

• **John W. Perry** has resigned as district manager of the Worcester office of the WPB to become manager of the Boston-New England district of the Florence Stove Co., Gardner, Mass.

OBITUARY...

• **Carl H. Becker,** 54, for a number of years industrial sales engineer of the Brush Div., Pittsburgh Plate Glass Co., Baltimore, died recently in Detroit from a heart attack.

• **Norbert T. Jacobs,** manager of sales, the Wood Shovel & Tool Co., Piqua, Ohio, died recently at Piqua Memorial Hospital, following a heart attack.

• **Peter J. Weigel,** 82, former secretary of the W. P. Taylor Co., iron founders, died Sept. 4. He had been associated with foundries in Buffalo for 32 years before his retirement in 1930.

• **Arthur M. Brewster,** 65, New England States field engineer for Advance Pressure Castings, Inc., Brooklyn, died Aug. 30.

• **Grant B. McLaughlin,** 66, president of Yates-McLaughlin, Inc., wholesale coal dealers, died recently. He was associated with the Carnegie Steel Co. at Mingo Junction, Ohio, before he came to Buffalo as superintendent of blast furnaces for the Donner Steel Co. in 1920. Eight years later he entered the wholesale coal business.

• **Malcolm Fleming,** 60, former vice-president and district manager of Hickman, Williams & Co., Cincinnati Branch, died recently at Holmes Hospital.

• **Clifford Egan,** 61, former president of the J. A. Fay & Egan Co., died in Cincinnati, recently, following an illness of six months. He was president of the company until about five years ago, after which time, he was employed by the War Manpower Commission.

For superior welding with alternating current use these RACO ELECTRODES

ELECTRODES FOR ALL-POSITION WELDING

High Ductility—Deep Penetration Type

RACO Type	A.W.S.—A.S.T.M. Cla
RACO 11	E 6011
RACO 7011	E 7011
RACO 9011	E 9011
RACO 10011	E 10011

Poor Fit-up Type

RACO Type	A.W.S.—A.S.T.M. Class
RACO 8	E 6012

Sheet Metal Welding Type

RACO Type	A.W.S.—A.S.T.M. Class
RACO 13	E 6013

★

ELECTRODES FOR POSITIONED WELDING

Horizontal Fillet Type

RACO Type	A.W.S.—A.S.T.M. Class
RACO 20	E 6020
RACO 64	E 7020
RACO 10020	E 10020

Flat-Position Type

RACO Type	A.W.S.—A.S.T.M. Class
RACO 5	E 6030

With the increasing popularity of transformer welders of all types, the demand for A.C. electrodes for welding mild steel and high-tensile, low-alloy steels is steadily mounting. The outstanding advantage of alternating current for welding is, of course, the practical elimination of magnetic arc blow. For this reason, A.C. electrodes are especially desirable in assemblies involving intricate corner welding, gapped seams, or under other conditions favoring arc blow.

All the above electrodes give excellent results when used with direct current. Samples on request.

The REID-AVERY COMPANY

INCORPORATED

DUNDALK BALTIMORE MARYLAND

SINCE 1919 PRODUCERS OF ARC WELDING ELECTRODES

Dear Editor:

ATOMIC BOMB SIDELIGHTS

Sir:

Would you please forward four reprints of the article "Atomic Bomb Sidelights" appearing in the Aug. 23 issue?

E. B. SORENSEN,
Assistant General Manager
Bowser, Inc.,
Chelsea, Mich.

Sir:

If a reprint or tear sheets are available, I would appreciate a copy. . . .

HERBERT A. LESHER
R. D. 1,
Mohawk, N. Y.

● Sorry, reprints of this article have not been made, but tear sheets have been forwarded.—Ed.

TANGENT BENDER

Sir:

In the Dear Editor page of the Aug. 16 issue, Mr. M. Hannaford of Williams & Wilson, Ltd., Montreal, asked the name of manufacturers of a tangent bender similar to that produced by us. You replied that the Cyril J. Bath Co., Cleveland, produced such equipment. We ask that you correct this error inasmuch as the machines are not similar—ours being electric-hydraulic self-contained while theirs is air operated.

G. O. GONDREE,
Assistant to the President
Struthers Wells Corp.,
Titusville, Pa.

● Sorry, we were wrong.—Ed.

LAMINATION DIES

Sir:

In the May 3 issue I saw an article "Increasing the Life and Accuracy of Lamination Dies" and would appreciate two copies.

WARREN F. RANDOLPH
Beaumont, Heller & Sperling,
Reading, Pa.

● Tear sheets have been mailed.—Ed.

REPAIR OF CASTINGS

Sir:

We would like to obtain two copies of "Repair of Defective Gray Iron Castings" by S. H. Brams, which appeared in the Aug. 9 issue.

D. A. WILSON,
General Purchasing Agent
Canadian Westinghouse Co., Ltd.,
Hamilton, Canada

● Tear sheets have been mailed.—Ed.

DRESSING WHEELS

Sir:

We would appreciate it if you will send us a copy of an article we read relative to forming of abrasive wheels with pressure roller.

FRED J. ZUCKERMAN
Teckna Plastics Co.,
Bayside, N. Y.

● Tear sheets of "Crushed Wheel Dressing in Form Grinding" by Richard Y. Moss, which appeared in the Feb. 15 issue, have been mailed.—Ed.

TOOL CONTROL

Sir:

We would like to receive a tear sheet of "Tool Control by Etched Identification" which was printed in the Nov. 30, 1944 issue.

WM. A. HEINE, JR.,
Chief Engineer
Acromark Co.,
Elizabeth, N. J.

● Tear sheets have been mailed.—Ed.

TYPE FACE COMPOSITION

Sir:

Could you give us information as to the composition of steel used for type face of typewriters and business machines?

CORA E. EMERY
Arthur D. Little, Inc.,
Cambridge, Mass.

● We believe that this is a variety of hard type metal usually of the following composition: Lead 70, tin 10, antimony 18, and copper 2.—Ed.

POLYSTYRENE PATTERNS

Sir:

In the News Front of the Aug. 16 issue mention is made of a new casting operation employing polystyrene. You state that a Chicago firm obtains accuracies of 0.0002 in. and that a Peru, Ind., plant will soon be in operation. Can you give us any further information on this practice?

N. M. FOOTE,
Chemical Engineering Section
Radio Corp. of America,
Camden, N. J.

Sir:

Would you send us the name and address. . . .

GEORGE W. COLEMAN,
Metallurgist
Parker Mfg. Co.,
Worcester, Mass.

● The Chicago firm referred to is the Illinois Precise Castings Co., 613 W. 16 St., Chicago 16, and the company in Peru, Ind., is the Centrucast Co. We expect to have a full length article on the subject in an early issue, but additional information could be obtained by writing to these companies. —Ed.

TIME STUDY

Sir:

Please send tear sheets on "Managerial Use of Time Study" by Ralph A. Stearns published in the Apr. 9 issue.

J. G. WILSON,
Methods Department
Walworth Co.,
Washington Park, Ill.

● Tear sheets have been mailed.—Ed.

DIE MATERIALS

Sir:

We should like to have tear sheets of the article "New Developments in Die Materials" by Richard Bredenbeck, which appeared in the Oct. 12, 1944 issue.

J. J. CORDIANO
Hardy Metallurgical Co.,
420 Lexington Ave., New York

● Tear sheets have been mailed.—Ed.

FLASH WELDING

Sir:

Will you kindly send me two reprinted copies of the article "Flash Welding Alloy-Steel Rings" by P. B. Scharf, which was in the Aug. 16 issue?

A. L. RUSTAY,
Asst. Chief Metallurgist
Wyman-Gordon Co.,
Worcester, Mass.

● Reprints of this article have not been made. However, tear sheets have been mailed.—Ed.

STABILIZING 18-8

Sir:

Will you please send me a copy of the article "Result of Stabilizing Heat Treatment on Welded 18-8 Stainless" by Wilson G. Hubbell from the June 21 issue?

RICHARD P. SEELIG,
Chief Engineer
Powder Metallurgy Corp.,
Long Island City, N. Y.

● Tear sheets have been mailed.—Ed.

PORTABLE ARMY SHELTERS

Sir:

In the Aug. 2 issue you have an article on portable Army squad shelters. We are interested in knowing if any of this equipment has been constructed and whether some will be placed on sale.

GEORGE W. SHOMO,
Treasurer
Confer Smith & Co., Inc.,
Hamburg, Pa.

● The sudden ending of the war resulted in complete termination of all contracts for portable army squad shelters before any of them had been delivered to the Army. It is, therefore, extremely unlikely that any of these shelters will find their way into civilian channels as surplus goods.—Ed.

SENDZIMER MILL

Sir:

I would like very much to have a copy of the article in your July 23, 1942, issue entitled "Armco Introduces Sendzimer Mill."

E. W. HARWELL,
District Sales Manager
Jones & Laughlin Steel Corp.,
Philadelphia 3

● Tear sheets have been mailed.—Ed.

RUST PREVENTIVE SOURCES

Sir:

Will you be good enough to give us a list of manufacturers making a rust preventive for raw steel plates and shapes.

O. L. FELGER,
Purchasing Agent
Higgins Industries, Inc.,
New Orleans 19

● A reprint of "Specifying Rust Preventives" in the June 7 issue has been mailed, which will doubtless give the information you desire.—Ed.

Monarch 10" Sensitive Precision Toolmaker's Lathe. For full details, write for Bulletin 10EE.

You'll save time and money in re-tooling, and get into production faster, if you take full advantage of the facilities offered by Monarch's 10" Sensitive Precision Toolmaker's Lathes. Noted since 1938 for the high accuracy and quality of its performance, this lathe has been refined and improved to enable it to do its job faster and better than ever before. Our engineers will help you put it, or others from our full line of toolroom and production turning machines, to work for quicker peacetime production. Address us at Sidney, Ohio, or at our nearest branch office.

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801 Fisher Building
Phone: Trinity 1-0426

INDIANAPOLIS, INDIANA
Maco Building
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Phone: Wabash 2650

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ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

This Industrial Week . . .

- ***Fundamental Basing Point Change Seen***
- ***Steel Ingot Rate Rises to 83.5 Pct***
- ***WPB and Industry Wrestle with Lead***

LOWER net prices to steel consumers near point of steel production, possible dispersion of industries, rougher competition among steelmakers and selling disadvantages to steel producers far removed from dense manufacturing centers, are a few of the results which will ultimately follow the steel industry's move now underway toward more and more basing points.

Steel producers are prepared to put an end to years of harassing by the Federal Trade Commission by a voluntary swing towards mill basing points on steel products now priced at only a few points. A broader basing point system is imminent, according to steel authorities, on alloy steels now covered by basing point price announcements recently made on stainless and tool steels.

As a direct result of the Supreme Court Corn Products Decision handed down last April, it is logical to expect that as the time goes on steel producers will eventually have named a basing point at or near the point of production for all steel products which are not based at such locations now.

Among the products expected to undergo basing point changes soon are electrical sheets and wire products, possibly followed at a later date by changes involving such products as pipe and tin mill products.

The imminent basing point setup may, over the next few years, result in relocation of production in those cases where freight absorption is economically unsound. Concurrent with this period of basing point expansion, there is expected to be a heavy drive on the part of steel producers for lower freight rates in an attempt to ease the freight absorption burden.

In the steel and other metalworking industries this week, observers were fearful that the epidemic of strikes now in progress with more to come may result in so heavy a drain upon worker's savings that the expected postwar consumer buying bubble may be somewhat deflated. Current management-labor conditions have all the earmarks of a knock-down drag-out fight and the action of some unions in adopting an uncompromising attitude in their demand for a 30 pct wage increase apparently means a last ditch fight to obtain wartime pay for a 40 hr peacetime week. Some way will have to be found to get around the paradoxical government policy announced recently that no wage increases could be given if they were to result in a price increase. The brunt of this peculiar statement rests upon industry since the unions have and are expected to ignore it.

THE steel industry during the past week despite its obstacles has again expanded steel production, the ingot rate having advanced from last week's revised figure of 80.5 pct of capacity to 83.5 pct of capacity this week. The tight fourth quarter steel situation continues to trouble steelmakers who have been forced to institute an informal allotment system to spread available steel among their consumers. In the majority of cases doling out of available production has been insufficient to meet requirements on the order books.

Steel mills have been attempting to persuade their customers to spread requirements over a longer period of time extending into 1946. Where this is not acceptable mills are in a quandary as to whether to cancel tonnage requirements which cannot be met and assuming them to be lost business. In many cases steel consumers when pressed for absolute minimum requirements have been willing to accept less steel than that on order.

Steel order volume booked in the past week declined from the upward trend in evidence since V-J Day. This may indicate that the first rush of buying for reconversion has placed sufficient steel on the books to meet early requirements. Lengthening of delivery dates for most products into 1946 is allowing customers more time to project their advanced schedules in the light of actual production progress over the next 60 to 90 days.

Demand for stainless steel is heavy despite aircraft cutbacks, with some deliveries scheduled for early next year. Requirements for nearly all basic steel products, particularly structurals, all types of sheets and concrete and merchant bars, far outstrips supply. Heavy rail orders recently have overflowed early openings on mill schedules for this product with the result that deliveries have been spread out over a several month period.

WAREHOUSES are doing a land-office-business with customers buying as much as possible from these sources because of their inability to get mill orders. Warehouse stocks, however, are dwindling rapidly under continued pressure from consumers attempting to get their reconversion completed as rapidly as possible.

In the nonferrous field a tug of war is in progress between WPB officials and the lead industry as to whether lead control should be relaxed or tightened. The industry questions the need of maintaining a stockpile which is approaching 70,000 tons now that the war is over. But the WPB claims to see a loss of some foreign supplies which would be necessary to balance uncontrolled demand. While the zinc industry reports more than adequate supplies of the metal in current production, Metals Reserves stocks have been distributed to some consumers recently prior to the full use of current production, but steps have been taken to prevent a repetition of this action.

• **NEW CONSTRUCTION OUTLOOK**—J. A. Krug, WPB chairman, disclosed that a survey of 41 selected industries, covering 4101 companies throughout the entire United States showed that the value of construction, tools and equipment projects now underway or planned for completion within the next 12 months totaled $520,225,000. This figure for the 41 industries, Mr. Krug pointed out, does not cover the whole reconversion field, but merely indicates the trend. Future surveys will broaden the coverage to give a more complete picture of what is underway. Furthermore, all reconversion industries as a group account for only a fraction of the total industrial plant and equipment expansion planned for the next year. Prominent examples of plant and equipment expansion, other than in the reconversion industries, are in the food processing and textile fields.

• **REJECTED MATERIAL RULING**—WPB has ruled that steel, copper or aluminum which has been rejected by a controlled materials producer's customer because of nonconformity with specifications may be used or disposed of by the producer without restrictions, subject only to inventory controls or other applicable regulations. This action was taken by amending Direction 16 to CMP Reg. 1. The amended regulation continues the provisions that a producer must schedule and make replacement of defective steel, copper or aluminum in preference to all other orders for similar material without requiring an additional allotment from his customer.

• **NE STEEL TREND**—Contrary to expectations prior to the end of the war, some producers report that NE steels are slipping in popularity. With alloying elements in greater abundance, and alloy steel available for early delivery, users are said to be avoiding kid glove techniques necessary in the use of many NE grades.

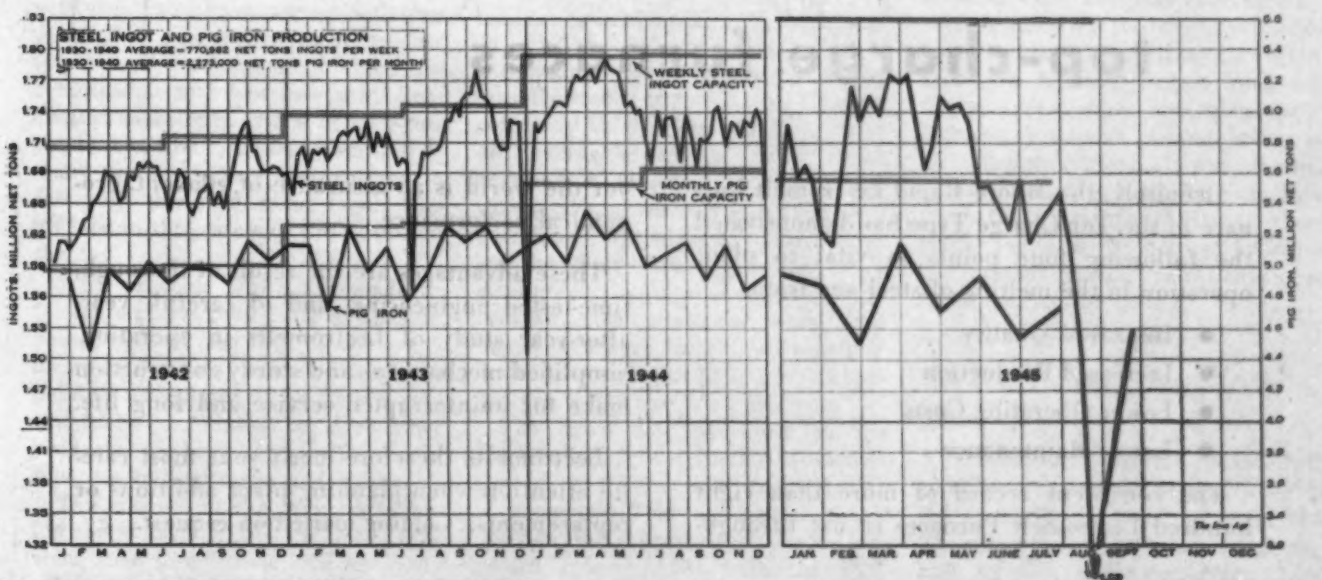
• **METAL INVENTORIES**—With the exception of copper and copper-base alloys, usable inventories at the end of the first quarter were lower than at the beginning of the quarter, according to the Bureau of Census, which has surveyed 90 pct of the steel consumers, 75 pct of copper users and 85 pct of aluminum consumers. The carbon steel inventories on last Mar. 31, declined to 6,483,000 tons from 7,069,000 tons on last Dec. 30; alloy steel inventories dropped to 749,000 tons from 775,000 tons and aluminum inventories declined to 271,000,000 lb from 285,000,000 lb. Copper and copper-base alloy inventories increased to 585,000,000 lb from 573,000,000 lb.

• **SITUATIONS WANTED**—In order to provide a job contact point in WPB with industry and other government agencies, Chairman J. A. Krug has established a group designated as the Industry Personnel Committee. This Committee is intended to serve as a means whereby WPB employees whose services are no longer required because of diminished industrial controls may be made available to employers both in industry and government. The group is located in Room 2060, Railroad Retirement Bldg., Washington 25, D. C., and may be contacted by telephone at Republic 7500, Ext. 72355.

• **BRITISH HOUSING ORDERS HALTED**—Commissioner Philip M. Klutznick of the Federal Housing Authority announced that further production in this country of temporary housing for British workers had been halted. This action was taken, he said, following termination of lend-lease and the decision by Great Britain not to take the remainder of the houses ordered. At the time of termination, approximately 10,000 of an original lend-lease order of 27,000 houses had been accepted by the British. Houses produced but not accepted will be disposed of under SPB procedures. Mr. Klutznick explained that while Britain has an acute need for new permanent housing, the American-made houses were not intended to meet any part of that need. They were built in good part of substitute materials and were intended only for emergency use to relieve the housing shortage in bombed-out war production centers.

• **STRUCTURAL INQUIRIES**—Midwest inquiries this week included: Chicago, addition to steel erection shop, Pullman Standard Car Mfg. Co., 2000 tons; Hines, Ill., tumor treatment hospital, Veterans Administration, U. S. Government, 2000 tons; Detroit, bus service station, Great Lakes Greyhound Lines, 1800 tons; various cities, four warehouse buildings, Floyd C. Fry Roofing Co., 1000 tons; Chicago, power plant, Sherwin Williams Paint Co., 700 tons. Awards included: Gallup, N. M., three 100 ft. spans, Atchison, Topeka and Santa Fe Railroad Co., American Bridge, 540 tons; Racine Wis., factory and office building, Modine Mfg. Co., Wisconsin Bridge, 210 tons.

Steel Ingot Production by Districts and Per Cent of Capacity



Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
September 11...	71.5*	83.0	81.0	88.0	87.5	93.0	75.0	95.0	96.5	89.0	88.0	97.5	89.0	89.5*
September 18...	75.0	88.0	86.5	90.0	87.5	93.0	75.0	95.0	96.5	89.5	89.0	97.5	89.0	89.5

* Revised

MOORE RAPID

Lectromelt

FURNACES

base your plans on *Lectromelt* top-charge furnaces

Definitely, the Moore Rapid Lectromelt Furnace of the Top-Charge Type has demonstrated the following four points so vital to plant operation in the melting of steel and iron:

- Improved Quality
- Increased Production
- Lower Operating Costs
- Lower Maintenance

The consistent record of more than eight hundred Lectromelt Furnaces in use throughout the world is an assurance of efficient, economical performance.

These advantages are the result of thorough, time-tested engineering, and of careful, year-after-year study of Lectromelts in operation. Simplified mechanisms and sturdy construction make for uninterrupted service and long life.

Lectromelts therefore merit your most careful attention when planning plant additions or replacements. Catalog mailed on request.

PITTSBURGH LECTROMELT FURNACE CORPORATION
Pittsburgh 30, Pennsylvania

Fundamental Steel Basing Point Change Imminent

New York

• • • **Lower net prices** to steel consumers near points of steel production, possible further dispersal of industries, rougher competition among steelmakers and selling disadvantages to steel producers far removed from dense manufacturing centers, are a few of the results which will ultimately follow the steel industry's move now underway toward more and more basing points.

Two weeks ago stainless steel went from a single basing point to a multiple basing point system with makers naming in nearly every case the point of manufacture or a location near it as a basing point for the products produced by the steel companies. In line with predictions made last week (THE IRON AGE, Sept. 13, p. 99) the move is spreading or will soon spread to other steel products.

Steel producers are prepared to put an end to years of harassing by the Federal Trade Commission by a voluntary swing toward mill basing points on steel products now priced at only a few points. A broader basing point system is imminent according to steel authorities on alloy steels not covered by basing point price announcements recently made on stainless and tool steels.

As a direct result of the Supreme Court Corn Products Decision handed down last April, it is logical to expect that as time goes on steel producers will eventually have named a basing point at or near the point of production for all steel products which are not based at such locations now. Specialties based only at one or at a few points, but which are manufactured in many more locations are expected to fall with this new trend soon. Significant in this category are electrical sheets.

Wire products which are made at far more places than there are basing points may be the first to achieve a complete pricing system based on point of production. This action may eventually be followed for such other products as bars, structural steels, pipe, tin mill products and others.

This change in the industry's basing point system, which may take some time to complete, will naturally affect most profoundly and will be resisted most strongly by large steel producers which are far removed from principal consuming market areas. The reluctance is expected to be temporary in view of the Supreme Court decision the tenaciousness with which the FTC has attacked the steel industry's selling practices. The move is a continuation of the pattern established in June 1938 when new basing points blossomed like early spring flowers.

At that time the elimination of the price differential between Pittsburgh, Birmingham and Chicago and the establishment of additional basing points by U. S. Steel set off a series of firecracker moves from which emerged a multitude of additional basing points, announced by the Corporation's competitors. This action had the effect of fencing in such large steel production centers as Pittsburgh, because such producers were then forced to absorb freight when selling in distant markets which enjoyed basing points for the same products.

The move now underway in the steel industry is a further accentuation of the 1938 action except that it is implemented by a Supreme Court decision and a preparation for an expected future battle with the FTC over the multiple basing point system. If changes now indicated are carried through, the selling practices in the steel industry will bear a semblance to an f.o.b. mill system.

The ultimate effect of such a trend on steel consumers is likely to be more decentralization of manufacturing industry towards a closer location to the source of its raw materials. Likewise there will be a tendency of steel producers in a given area to exploit to the fullest extent potential customers in that area and to resist by various methods the encroachment on this business by steel producers from other areas.

If over the next few years the steel pricing system settles down along the lines described, large steel producers in localities far from major markets will be faced with the choice of either eliminating high-cost products on which substantial freight must be absorbed to find a market, or they must seriously consider the relocation of part of their output or the building of new plants in denser manufacturing areas. That some of the major companies have already explored the initial prospects of such a decision is already known.

One alternative for steel producers in attempting to regain financial loss, which will result from increased freight absorption following basing point expansions, will be a drive toward's lower freight rates. The warning flag has already gone up on this drive with the Corporation having spent at least the past year or more getting ready for its freight reduction wrestle with the railroads. Significantly U. S. Steel Corp.'s hand was tipped a few years ago when B. F. Fairless, president, served notice of the company's intent. It was also significant that the battle cry emerged from the Pittsburgh district whose plants would be the hardest hit when the present basing point expansion trend had run its course.

Price Evolution

• • • The basing point trend discussed in this story is a natural evolution of pricing methods following the outlawing of the Pittsburgh Plus practice used prior to 1924. But, like all evolution, changes were not necessarily made at the exact time of the announcements. There were variations and concessions from Pittsburgh Plus setup before the FTC made its ruling just as there were variations from the Pittsburgh-Birmingham-Chicago differential in prices long before it was wiped out in 1938. Likewise today and in the prewar period there have been cases where so-called normal selling prices have been changed to meet competitive conditions but which were not comprehensive enough to represent an overall change—but they have contributed to major changes when the latter have been made "official."

Aircraft Plant to Close

Chicago

• • • **Douglas Aircraft** plant will completely cease production lines at its Park Ridge plant by Sept. 30. The plant built C-54 transport planes, and at one time employed 17,000 workers. The plant is an Army facility operated by Douglas and possession will revert to the Army.

Geneva Steel Plant May Close Down Soon, Disposal Plans Uncertain

• • • By TOM CAMPBELL • • •

New York

• • • Lack of a definite governmental policy for disposal of RFC steel plants and the interjection of politics into the problem, may find Uncle Sam with a large steel plant on his hands soon, minus operations and employees.

Despite offers of three steel companies to take over Geneva Steel Co., government-owned U. S. Steel subsidiary, near Salt Lake City, Utah, either by purchase or by lease, procrastination at Washington has so far resulted in the U. S. Steel Corp. withdrawing its hat from the ring and little or no action on the other two offers.

Apparently embarrassed by charges of monopoly and other pressure points, U. S. Steel Corp. recently disclaimed any desire to take over the Geneva plant. It is practically certain that its answer to a recent government letter asking that it reconsider its position and again bid on Geneva will be a courteous but flat "No!" It is understood that the corporation has washed its hands of the Geneva project and will soon make operative a clause in the contract it signed with the DPC which calls for an end of operations 90 days after the end of hostilities.

Some repercussions from the Far West are expected when the plant which at its peak employed close to 5000 workers shuts down soon. It may take months of negotiations before the RFC finally determines who may buy or lease the mill. Whether or not the same workers will offer their services, when and if the mill starts up again, remains to be seen.

It was only after long consultation and persuasion that Mormon Church officials looked upon this industrial project with lukewarm favor and expressed no disapproval of employment of Mormon workers. If a wholesale layoff should occur, as it now seems likely, "reconvincing" Mormon officials may be necessary. The alternative to this in case Mormon labor is reluctant to reenter steel business would be to import workers from other areas. If the efforts of the U. S. Steel Corp. to do this in the early stages of the Geneva plant are any criterion, such a move might fall far short of its goal.

Far western industrialists, Utah officials and others interested in the establishment of a western steel industry, months ago appealed to the government to make haste on its disposal plans before a complete shutdown becomes imminent. Reflecting further the political angle was the quiet departure from Washington recently by Dr. J. R. Mahoney, Utah University business expert, who had been assigned the job of reporting recommendations for the disposal of war steel plants. It is understood that the report was killed and the job turned over to a WPB offical.

Some sources believe that Dr. Mahoney had recommended U. S. Steel as one "most likely to succeed" with the operation of the Geneva plant. Criticism of Dr. Mahoney as being strongly pro-U. S. Steel does not hold water, according to Utah sources. It is said that in his initial exploration of the Geneva steel plant problem he was anything but pro-corporation. The simple answer probably is that Dr. Mahoney is pro-Utah.

Steel Price-Wage Shadowboxing

• • • In reply to CIO President Philip Murray's demand for an immediate wage increase of $2 per day for steelworkers, to be obtained through collective bargaining, President Benjamin F. Fairless of U. S. Steel Corp. declared the following:

"No matter how much U. S. Steel may believe in high wages, wages cannot be increased in the steel industry at this time unless prices are materially increased.

"Recent executive orders provided that wages cannot be raised voluntarily if the increased cost would result in a price increase. . . . To hold out through extended bargaining any hope to employees . . . that this important wage issue can be settled between the Union and ourselves under existing government controls would not be honest."

A study of steel industry earnings during the war period by the Steelworkers Union stated the following:

"Never before have the steel companies been so rich. For five years of war production the steel industry has charged the American people over two billion dollars in open and concealed profits. About one billion of these war profits have been kept by the industry—added to its total financial resources, while other millions have been concealed. $765 million additional dollars—more than three-quarters of a billion—have been paid out to stockholders.

"Contrast this with the financial position of America's 475,000 steelworkers. In five years of war work, they have accumulated only a total of $285 million in savings, or $600 a worker."

Makes New Geneva Offer

Denver

• • • A new proposal for the lease of Geneva Steel Co. involving a request of the DPC to install approximately $60 million worth of equipment has been made by the Colorado Fuel & Iron Corp. Also in the proposal is a schedule of rentals to be paid to the DPC ranging from 25c a ton on pig iron to 50c a ton on billets, from 50c a ton on hot strip steel to $1.50 a ton on tin plate.

CF&I has also proposed that net profits in excess of $3 a ton would be divided half to the government to reduce the plant valuation and half to retire preferred stock. The lease would run for a five-year period.

CF&I proposed that if the facilities were added to reconvert the plant to peacetime use it would supervise the installation and operate the plant in its present condition during the installation period.

Construction Controls Lifted

Washington

• • • With the exception of tin and lead, restrictions on the use of critical materials and equipment in housing construction have been lifted by WPB.

This was accomplished by revocation of Schedules I and II of Order P-55-C.

The use of lead and tin, WPB pointed out, is still limited by Orders M-38 and M-43, respectively.

Order P-55-C still remains in effect.

J & L Renegotiation Complete

Pittsburgh

• • • Jones & Laughlin Steel Corp. has completed its renegotiation proceedings with the government covering its 1944 business, and profits for that year have been determined not excessive, the company announced.

Attorney General Recommends Breakup of Alcoa Due to Monopoly

Washington

• • • Recommending that disposal of surplus aluminum plants by the Surplus Property Board be guided by the necessity of creating competition in the industry, Attorney General Tom C. Clark in a report submitted to Congress on Sept. 17 urged that the Aluminum Company of America be divided into competing companies.

Mr. Clark left to Congress the decision of how far the government shall go in making the aluminum industry competitive, pointing out that "No punitive atomization of ALCOA is contemplated."

Although 50 pct of aluminum facilities are government financed and through DPC, the report pointed out that the seven-fold expansion of the industry since 1939 has not altered Alcoa's dominant position. From the operating standpoint, the Attorney General charged, Alcoa has completely absorbed publicly-owned aluminum facilities into its private business structure. These facilities, he pointed out, can produce 878 million lb of aluminum compared with 350 million lb in 1939—a 250 pct increase. In the fabricated aluminum field, Alcoa controlled facilities now have a peak capacity of 1.5 billion lb of sheet rod and bar, extrusions and castings, plus other facilities for further conversion.

ALCOA meanwhile denied the existence of a bauxite shortage. This was determined by the courts, it was said, and confirmed by the Reynolds Metals Co. in a recent statement that it had been able to obtain sufficient bauxite to last 100 years.

Multiple sources of supply are needed to fully develop the future aluminum market, Mr. Clark said, with the automobile industry the largest prospective user. Other industries which the report pointed out as potential large users were railroad car manufacturing, shipbuilding, housing, electrical appliances, containers, packaging, paints, veneers and coating materials.

Among the newer uses mentioned was a process developed by the Republic Steel Corp. and Chrysler Corp. for coating steel sheets with aluminum to increase resistance to corrosion and, also, to increase heat conductivity. If these processes were put to general use, iron and steel products would require a large amount of aluminum for coating purposes.

Other recommendations by the Attorney General included: A complete survey of all available bauxite reserves in the United States, especially those held by Alcoa and other large companies. Mr. Clark said that Alcoa controlled practically all the high grade domestic bauxite available for aluminum production. Engineering studies to determine power costs at various DPC producing plants and the possibilities of relocating and reducing the size of several of the larger units.

Government-financed and owned plants have higher production costs than Alcoa's and the Canadian Shipshaw plant, Mr. Clark said.

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Alcoa Answers Clark Demands

Pittsburgh

• • • Proposals of the Attorney-General to split up Aluminum Co. of America were strongly attacked this week by Alcoa.

The company said the plan was tantamount to "government subsidies," and could not be justified by the facts in the case. It stated that RFC-owned aluminum capacity represented 57 pct of the industry, against 36 pct for Alcoa and 8 pct for Reynolds Metals.

The position of Attorney-General Clark that competition would spur the use of aluminum in such industries as automobiles and railway equipment was answered in the company statement. It said:

"There is no likelihood of either industry shifting to the use of aluminum if the aluminum industry is to be operated on anything as transient and unsound as a government subsidy."

Earlier the company statement had taken the position that the Attorney-General's proposals were tantamount to subsidy for operators of government-operated plants. "Subsidies," said the Alcoa remarks, "whether they take the form of outright grants of the taxpayer's money, discriminatory power rates, or any other form . . . are inexcusable."

The monopoly charges of the Attorney-General were answered by the statement from Alcoa that the government-owned aluminum plants are the most modern in the world. "RFC can lease or sell them to anyone it chooses," it was pointed out.

Furthermore, it was stated, there is no shortage of bauxite, raw material from which aluminum is smelted.

The statement also reported the finding of the Circuit Court of Appeals that determination of whether Alcoa had a monopoly in its field should not be made until government plants are disposed of.

Navy In the Dark

New York

• • • Even the Navy was in the dark for a while as a result of mass contract terminations following VJ-Day. Working far into the night cancelling contracts, a Navy purchasing unit at Bayonne, N. J., was thrown into darkness when the lights went out. Investigation disclosed that an eager officer, slashing through piles of contracts, had cancelled the facility's contract with the electric company. At another office a production contract had been wound up according to agreement by a contract to purchase an entire plant's productive facilities for the nominal sum of $1.00. An automatic 50 pct cut ordered for all contracts brought the sum down to 50¢, with all forms reexecuted in sextuplate.

Tube Plant Is Opened

Cleveland

• • • United Tube Corp. of Ohio, producer of welded mechanical tubing, has opened a new plant here at 2134 West 53rd St. Production of mechanical steel and alloy irrigation pressure tubing, sized from ⅝ in. to 6½ in., has begun.

The company is associated with United Tube Corp. of Pennsylvania and Ellwood Products Corp., both of Ellwood City, Pa. In conjunction with them, United Tube of Ohio can furnish cold drawn tubing, electric and butt weld, in a great variety of fabrications. The new plant may also produce stainless and alloy tubing.

McLouth Begins Stainless Production

Detroit

• • • **McLouth Steel Corp.**, large local processor, has begun production of stainless steel sheet and strip, marking the first time those commodities have been turned out in the Detroit area. Production is now limited, being carried on in present facilities, but a new division is being set up to manufacture stainless steel, and when this is completed output will be expanded.

A new building 412 x 75 ft is being erected on property purchased adjoining the present plant site. It will house two new cold rolling mills with auxiliary electrical motors and controls and finishing and production equipment. In another new building additional facilities and equipment provide a new continuous annealing and pickling line for processing the stainless steel.

Purchase orders were placed for the new mills and equipment early this year and their delivery and installation will be completed before the end of the year. Full production will be attained for a wide range of gages and types of stainless steel to meet the rapidly increasing demand for it in the automotive, refrigeration, home appliance, dairy food equipment and other industries, it was stated by Donald B. McLouth, president.

Until the shifting around of basing points a fortnight ago, McLouth was moving its limited production on a Pittsburgh base. Since then Cleveland and Chicago have been added as basing points.

Financial and Official Setup of Reynold's Mexican Plant Named

New York

• • • **R. S. Reynolds**, president, Reynolds Metals Co., announced the financial setup and the official personnel of the company's new Mexican subsidiary, Reynolds Internacional de Mexico, S. A. (THE IRON AGE, May 31, 1945, p. 116).

Under the completed arrangements the new Reynolds company will build an aluminum plant at Mexico City, a plant which will be in operation by mid-1946. Initially, the plant will produce aluminum sheet and aluminum, tin and lead foil. An aluminum powder plant will be built, and later the plant's activities will be expanded to cover nearly every phase of aluminum fabrication.

Of the new company's nine directors, five are officials of Reynolds Metals and four are Mexican citizens. The nine, with their official titles are: R. S. Reynolds, chairman; J. Louis Reynolds, president; Walter L. Rice, vice-president; R. S. Reynolds, Jr., vice-president and treasurer; Edwin Taranger, vice-president and general manager; Atanasio G. Saravia, vice-chairman; Angel Rivera, Felix Aramburu Zavala and Emilio Thalman. The latter four are the Mexican directors.

Capitalized at $1,509,000, the new Mexican subsidiary had the support of the Reynolds enterprises and the Mexican financial interests. Banco Nacional de Mexico, S.A., and Inversiones Latinas, S.A., Mexico City, took leading parts in setting up the company. Reynolds Metals Co. holds 51 pct of the interest in the company and the Mexican interests hold the balance.

Stainless Steel Basing Points

New York

• • • **In addition to** the basing points announced last week (See THE IRON AGE, Sept. 13, P. 99), the following have been established:

The Steel & Tube Div. of the Timken Roller Bearing Co. has established Canton, Ohio, as basing point for stainless steel ingots, blooms, billets, slabs, hot-rolled bars, cold-finished bars, and forging billets. All tool steel products of Timken Steel & Tube Div. were also placed on the Canton basing point. Recently Timken announced that carbon, alloy and stainless steel pressure tubing, and stainless steel mechanical tubing would be sold from a Canton basing point.

Crucible Steel Co. of America has established new stainless steel basing points at Pittsburgh for stainless steel blooms, billets, hot-rolled bars, plates, cold-finished or polished sheets, and cold-finished strips. A Syracuse basing point has been established for billets, hot-rolled bars, cold-finished bars, hot-rolled rods and cold-finished wire. Newark has been established as the basing point to cover products manufactured by the Atha, Spaulding & Jennings Works, including billets, hot-rolled and cold-finished bars, hot-rolled rods and cold-finished wire and cold-rolled strip.

American Rolling Mill Co. has made Middletown, Ohio, basing point for stainless steel sheets and plates.

Rustless Iron & Steel Corp. has established Baltimore as a basing point for stainless steel ingots, forging billets, re-rolling slabs, hot-rolled bars, cold-finished bars, cold-finished wire, and cold-rolled flat wire.

Gosly Mfg. & Supply Co. Fort Wayne, Ind., has established Fort Wayne as basing point for stainless steel bars, and will observe all other basing points established on this product.

Sharon Steel Co. has made Youngstown a basing point on ingots, blooms, billets, slabs and hot and cold-rolled strip.

Republic Steel Corp. has made Canton, Ohio, a basing point on stainless forging billets, hot rolled bars, cold finished bars and wire, hot and cold rolled strip, sheets and plate.

Labor Shortages Hinder Midwest Foundry Output

Chicago

• • • **Production by gray iron and steel foundries in Illinois, Wis., Iowa and Ind. is restricted to 60 pct of capacity due to manpower shortage, a check of 131 foundries by the Region VI office of War Production Board shows.**

This deficiency is termed by Samuel J. Campbell, chief deputy director, as "one of the chief bottlenecks" in reaching maximum production capacity of certain kinds of needed civilian goods such as electric irons, washing machines, mangles, stoves and other kitchen appliances.

Of 76 foundries that have replied to inquiries from the board as to whether or not they could accept more orders for castings, 69 reported they had no more production capacity available owing to a lack of labor. One factory located in an area where labor was available said that out of 50 applicants sent to them by United States Employment Service only one would take a job in a foundry. Only seven foundries in the region reported open capacity: Two for gray iron, two for malleable iron and three for cast steel.

August Steel Output Lowest in 5 Years

New York

• • • **Steel production** in August fell to the lowest point in 62 months when the sudden coming of peace forced steel users and steel producers into a period of adjustment of production schedules, according to the American Iron & Steel Institute.

The total output of steel ingots and steel for castings in August was 5,712,770 tons, compared with 6,987,008 tons in July (revised), and 7,498,913 tons in August, 1944.

The August production was the lowest since June, 1940, when output was 5,657,443 tons. Nevertheless, the actual tonnage produced in August exceeded output in all but two months of 1929, the best peacetime steel production year on record.

The percentage of capacity operated in August was 70.4,, lowest rate since April, 1940, when operations were 61.2 pct. In July the monthly rate was 86.3 pct, and in August, 1944, the rate was 94.1 pct.

Following the Aug. 14 announcement of Japan's capitulation, steel operations dropped off sharply. In recent weeks the rate has been improving, however.

YEAR 1945

Based on Reports by Companies which in 1944 made 97.9% of the Open Hearth, 100% of the Bessemer and 86.7% of the Electric Ingot and Steel for Castings Production

Period	Estimated Production—All Companies								Calculated weekly production, all companies (Net tons)	Number of weeks in month
	OPEN HEARTH		BESSEMER		ELECTRIC		TOTAL			
	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity		
January	6,468,815	90.5	379,062	76.0	358,346	77.3	7,206,223	88.8	1,626,687	4.43
February	5,967,842	92.4	347,227	77.1	339,520	81.1	6,654,589	90.8	1,663,647	4.00
March	6,927,377	96.9	398,351	79.8	382,237	82.4	7,707,965	95.0	1,739,947	4.43
1st Quarter	*19,364,034*	*93.3*	*1,124,640*	*77.6*	*1,080,103*	*80.2*	*21,568,777*	*91.6*	*1,677,199*	*12.86*
April	6,541,097	94.4	372,952	77.2	377,877	84.1	7,291,926	92.8	1,699,750	4.29
May	6,663,577	93.2	402,100	80.6	386,075	83.3	7,451,752	91.8	1,682,111	4.43
June	6,129,266	88.5	379,807	78.6	333,217	74.2	6,842,290	87.1	1,594,939	4.29
2nd Quarter	*19,333,940*	*92.1*	*1,154,859*	*78.8*	*1,097,169*	*80.6*	*21,585,968*	*90.6*	*1,659,183*	*13.01*
1st 6 Months	*38,697,974*	*92.7*	*2,279,499*	*78.2*	*2,177,272*	*80.4*	*43,154,745*	*91.1*	*1,668,139*	*25.87*
*July	6,318,463	88.6	381,832	76.7	286,713	61.9	6,987,008	86.3	1,580,771	4.42
†August	5,156,693	72.1	347,047	69.5	209,030	45.1	5,712,770	70.4	1,289,564	4.43
September										4.28
3rd Quarter										*13.13*
9 months										*39.00*
October										4.43
November										4.29
December										4.42
4th Quarter										*13.14*
2nd 6 months										*26.27*
Total										52.14

Note—The percentages of capacity operated are calculated on weekly capacities of 1,614,330 net tons open hearth, 112,658 net tons Bessemer and 104,640 net tons electric ingots and steel for castings, total 1,831,626 net tons based on annual capacities as of January 1, 1945 as follows: Open hearth 84,171,390 net tons, Bessemer 5,874,000 net tons, Electric 5,455,080 net tons.

* Revised.
† Preliminary figures, subject to revision.

YEAR 1944

Based on Reports by Companies which in 1944 made 97.9% of the Open Hearth, 100% of the Bessemer and 86.7% of the Electric Ingot and Steel for Castings Production

Period	Estimated Production—All Companies								Calculated weekly production, all companies (Net tons)	Number of weeks in month
	OPEN HEARTH		BESSEMER		ELECTRIC		TOTAL			
	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity		
January	6,770,423	97.2	439,551	85.4	382,629	84.4	7,592,603	95.7	1,713,906	4.43
February	6,410,914	98.5	409,781	85.2	373,314	88.1	7,194,009	97.0	1,737,683	4.14
March	6,977,466	100.1	455,368	88.5	393,423	86.8	7,826,257	98.6	1,766,649	4.43
1st Quarter	*20,158,803*	*98.6*	*1,304,700*	*86.4*	*1,149,366*	*86.4*	*22,612,869*	*97.1*	*1,739,451*	*13.00*
April	6,789,422	100.6	437,472	87.8	366,794	83.5	7,593,688	98.8	1,770,090	4.29
May	6,879,253	98.7	437,444	85.0	385,879	85.1	7,702,576	97.1	1,738,730	4.43
June	6,463,049	95.8	419,699	84.2	351,509	80.1	7,234,257	94.1	1,686,307	4.29
2nd Quarter	*20,131,724*	*98.4*	*1,294,615*	*85.6*	*1,104,182*	*82.9*	*22,530,521*	*96.7*	*1,731,785*	*13.01*
1st 6 months	*40,290,527*	*98.5*	*2,599,315*	*86.0*	*2,253,548*	*84.7*	*45,143,390*	*96.9*	*1,735,617*	*26.01*
July	6,743,812	*96.6	415,543	80.9	339,032	74.6	7,498,387	94.3	1,696,468	4.42
August	6,715,835	95.9	429,672	83.5	353,406	77.6	7,498,913	94.1	1,692,757	4.43
September	6,501,944	96.1	398,058	80.1	335,109	76.2	7,235,111	94.0	1,690,446	4.28
3rd Quarter	*19,961,591*	*96.2*	*1,243,273*	*81.5*	*1,027,547*	*76.2*	*22,232,411*	*94.1*	*1,693,253*	*13.13*
9 months	*60,252,118*	*97.7*	*3,842,588*	*84.5*	*3,281,095*	*81.8*	*67,375,801*	*96.0*	*1,721,405*	*39.14*
October	6,860,921	98.0	420,105	81.6	339,859	74.7	7,620,885	95.6	1,720,290	4.43
November	6,572,454	97.0	403,908	81.0	302,357	68.6	7,278,719	94.3	1,696,671	4.29
December	6,678,460	95.6	373,322	72.7	314,388	69.2	7,366,170	92.6	1,666,554	4.42
4th Quarter	*20,111,835*	*96.9*	*1,197,335*	*78.4*	*956,604*	*70.8*	*22,265,774*	*94.2*	*1,694,303*	*13.14*
2nd 6 months	*40,073,426*	*96.5*	*2,440,608*	*80.0*	*1,984,151*	*73.5*	*44,498,185*	*94.2*	*1,693,878*	*26.27*
Total	80,363,953	97.5	5,039,923	83.0	4,237,699	79.0	89,641,575	95.5	1,714,644	52.28

Note—The percentages of capacity operated are calculated on weekly capacities of 1,572,750 net tons open hearth, 116,182 net tons Bessemer and 105,336 net tons electric ingots and steel for castings, total 1,791,267 net tons; based on annual capacities as of Jan. 1, 1945 as follows: Open hearth 82,251,510 net tons, Bessemer 5,874,000 net tons, Electric 5,350,080 net tons. Beginning July 1, 1944, the percentages of capacity operated are calculated on weekly capacities of 1,560,042 net tons open hearth, 116,182 net tons Bessemer and 102,737 net tons electric ingots and steel for castings, total 1,778,961 net tons; based on annual capacities as follows: Open hearth 82,604,600 net tons, Bessemer 6,074,009 net tons, Electric 5,373,110 net tons.

Steel Output Through August, 1945

Special Tooling For B-29 Engine Ordered Scrapped by Air Forces

Chicago

• • • **Scrapping** or abandonment of $23 million of special tooling and fixtures used in the production of B-29 engines at the Chrysler Corp.'s Dodge Chicago plant has been approved by the Army Air Forces following an inspection by panel of industry, Dodge and Reconstruction Finance Corp. representatives. When the machine tools are offered for sale the fixtures and attachments will be left on them but will not be considered in the sales price. Purchasers will be entitled to salvage or scrap the excess tooling.

Public inspection of the surplus machine tools at the plant will take place within 60 days with pricing under the Clayton formula. Most of the tools have been used in production since January, 1944, indicating a sale price of approximately 60 pct of original cost.

Surplus tools at the plant which are not sold will be prepared for storage, with special tooling previously being stripped and sold as scrap. Special spare and replacement fixtures also will be sold as scrap.

Similar decisions affecting special tools, dies and fixtures have been made in connection with the equipment at the Studebaker operated DPC plant at South Bend and the Chicago Buick-DPC plant.

Cost of removing special tooling and fixtures from the machines would exceed their scrap value, the Air Forces points out. Cost of special tooling was amortized over the first 10,000 B-29 engines turned out by Dodge. A total of 18,413 were produced before assembly lines shut down at the end of August.

The Dodge plant contains 10,800 machine tools, the majority of which can be channeled to industry, but a study is being made of special machinery which may be scrapped.

Return to RFC on any tooling scrapped might be less than 0.1 pct of original cost, it was indicated.

RFC Cancels Lease On Andrews Steel Co.

Cincinnati

• • • **The Reconstruction** Finance Corp. has canceled its lease on the Andrews Steel Co. plant at Newport, Ky., company officials announced this week.

Charles H. Stamm, president, said the plant will be closed temporarily Sept. 30 for inventory. Future plans will be announced. Andrews Steel, which employs approximately 1000 men, is one of the few privately-owned plants which were operated by the government during the war on a voluntary basis.

The RFC leased the facility after the owners found it impossible to produce a special steel ordered by the government at the fixed federal price. The owners were placed in charge of the plant by RFC.

Canadian Shipbuilding Will Continue After War Production Ceases

Ottawa

• • • C. D. Howe, Minister of Munitions and Supply, announced that war production in Canada will continue on a greatly reduced scale at least until the end of this year. The emphasis will be on shipbuilding, which will continue well into 1946. Reviewing Canada's war production program Mr. Howe states:

"Cutbacks in war production have been proceeding in an orderly fashion since before the collapse of Germany. For this reason, reconversion of factories and the re-employment of war workers are proceeding rapidly, and the demands for industrial workers still far exceed the supply. On V-J Day, Mutual Aid contracts for munitions were canceled, and some new contracts are being negotiated under financial arrangements which are being discussed. Meanwhile, work on urgent orders has not been held up. Since early spring the department has taken all possible steps to curtail inventories of raw materials, components and parts required for war production. On V-J Day all contracts for such materials were immediately cancelled, except in a few instances of contracts for other governments where action could not be taken until our Allies had reviewed their requirements. Because of this factor and because the department has kept a watchful eye on capital expenditures and on renewal of contracts, the cancelation costs will be surprisingly low."

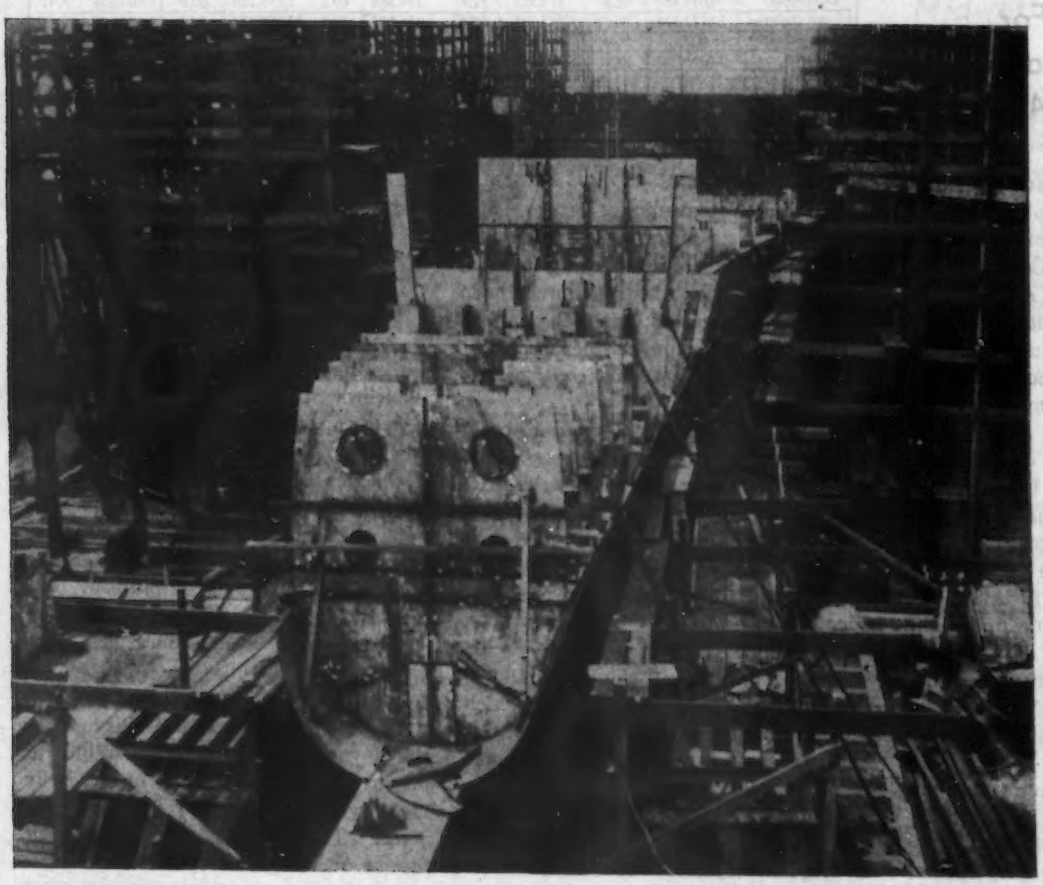
Briefly, here is how Canada is winding up its business on the war production front, the Minister explained: shipbuilding and ship repairs will provide activity in some Canadian yards well into 1946. Four Tribal class destroyers for the Canadian Navy will be completed. A substantial number of ships on order for the British Admiralty and the British Ministry of War Transport also will be completed.

Aircraft contracts for United Kingdom and United States account in the main have been canceled. One RCAF order is continuing. Manufacture of 25-pounder high explosive shell, 5.5 in. 80-pounder shell and grenades will continue on reduced scale at D.I.L. Cherrier plant. Production of certain types of small arms ammunition will continue at fair rate. Until inventories are established it will not be possible to schedule all requirements for Canadian and foreign account.

Chemicals and explosives production has been canceled in all lines, with the exception of picrite which will continue at reduced rate. Armored vehicle production has been discontinued. Automotive war production will terminate in the near future. Cancellation of all maintenance spares went into effect on V-J Day.

Railway equipment is not required for military purposes. Production for domestic and export consumption will continue at an accelerated rate. Instruments and signal devices: No cancellations have been received to date from British Ministry of Supply, Dept. of National Defence and Dept. of Transport, for radar, newly developed signals and instruments stores, and other types of equipment still required. U. S. contracts canceled.

Armament supply and navel equipment, guns and mountings have not been canceled by British Admiralty. Some contracts canceled for British Ministry of Supply. Orders for U. S. account will be terminated at fixed objective. Orders under Mutual Aid will continue pending conclusion of new financial arrangements.



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CONTRACT CANCELED: *After the Japanese surrender, the Navy announced cancellation of the contract with the Newport News Shipbuilding & Drydock Co., thereby halting construction on the Essex class aircraft carrier IWO JIMA.*

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Wire Products and Template Prices Drop in Iberian Peninsula

Barcelona, Spain

• • • Steel prices have not changed in Spain recently except for wire products, especially nails. Wire products prices have dropped on nails imported into Spain and Portugal. Swedish wire nails are now offered at an equivalent of $107 per ton, c.i.f., Lisbon. English tinplate prices have dropped in the free market and compensation basis.

Freight rates for iron and steel are sharply declining. Sweden has reduced the rates to Spain and Portugal on ship plates from $19.00 to $11.00 per ton, and for tool steel from $23.00 to $16.00 per ton. Freight rates for iron ores from Morocco to Great Britain have dropped from $9.00 to $5.50 per ton, while the insurance since the beginning of July was reduced from 2.3 pct to 0.8 pct of the cargo valuation.

Spain has started production of alloy steel containing columbium in quantities from two pct to four pct, and uses this alloy for the manufacture of electronic tubes and other electrical products. The deposits of columbium in Spain, found generally with titanium, are abundant, and the first 18-8 Spanish stainless steels, produced at Bilbao, also use columbium as a stabilizing element. Steel production in Spain during July amounted to 59,254 net tons, while iron ore output totaled 180,787 net tons and ferromanganese production amounted to 4995 net tons. Coal output during the same month was 1,112,648 net tons.

Belgium has again started to export iron and steel products for delivery in November, but only moderate quantities are available. Belgium is trying to trade steel for foodstuffs. It has been learned that all contracts together for shipment this year total about 22,000 tons, of which about 3700 tons are blooms and steel bars. Purchasers are Spain, Portugal, Switzerland, Turkey and the Near East, but no sales have yet been made to Latin America.

When France was liberated in August 1944, Portugal was left with about $29,700,000 worth of contracts unfilled by Germany, while Spain held contracts with Germany totaling about $23,700,000. This included machinery for hydroelectric plants, locomotives, machinery, rails (20,000 tons), tinplate and other items. Railway material also was included in these contracts, but some had been forthcoming through Switzerland in the spring of 1945 with permission of the Allied governments. Portugal, which cannot hope to get anything further from Germany, is attempting now to shift over the contracts to other foreign countries and negotiations were started with American, Swedish and British interests. In Spain, equal efforts to buy elsewhere have not yet started. The bulk of the unfilled orders for Spain consist of radio material, machine tools, electrical equipment and motor cars. On compensation basis, Spain granted, in the early weeks of July, contracts among which about 150,000 tons of Welsh coal would be paid for with tomato pulp; steel for shipyards from Scotland against bananas and other fruits; and about 17,000 tons of wheat from Canada for wines and cork.

Industry is attempting to expand in Spain. Output of steel tubes, the largest produced of which is Cía. Anon. de Tubos Industrials R.P.G., has increased from 2700 tons in 1939 to 14,300 tons in 1944. The second largest Spanish aluminum producer, the S.A. Aluminio de Valadolid, with capacity of about 10,000 tons a year, will start production in October 1945. The English company, Devis, Ltd., started production of electric locomotives in Spain recently for the rapidly increasing electrified railways system. The factory is situated at Valencia and passenger equipment as well as 35 ton, 3000 hp locomotives are being constructed.

Spanish shipyards at the end of August had 172 ships on the ways. Of these, 145 are motor vessels and 27 are steamers, of which six are tankers. The bulk of the vessels are small coastal and fishery vessels. Portugal shipyards launched eight vessels totaling 12,100 gross tons during the first half of 1945, among which was a 5000 ton freighter. The capacity of Portuguese-Spanish shipyards will not be expanded and no new yards are under construction.

Plant Reconversion Survey Encouraging

Chicago

• • • The Regional War Production Board office has completed a reconversion survey indicating that of 21,172 former war plants in Illinois, Indiana, Iowa and Wisconsin, 16,143 factories are busy.

Of 14,000 plants in the Chicago District 12,600 are going at a good clip either at civilian work or turning out the substantial volume of war contracts necessary to keep the military establishment supplied. Of the 14,000 factories and shops in the Chicago District, it is estimated that 70 pct are working to the capacity of their available labor force, 20 pct are hampered owing to the lack of certain material still in short supply and 10 pct are still in the process of reconversion.

Other WPB districts reporting a high rate of return to normal productivity besides Chicago were Milwaukee and Madison, Wis., and Indianapolis and South Bend, Ind. Shortages reported are mainly in iron castings, some critical metal components, in machine tools worn out in war production, building materials, mainly lumber and brick.

GERMANS BEGIN MINE OPERATIONS: *A modern mine in the Ruhr section at Walsum, Germany, has reopened recently and is again producing coal, although some bombed sections have not yet been repaired. Because most of western Europe depends on Ruhr coal, France is expected to demand internationalization of the area.*

Cars, Locomotives and Other Equipment Ordered by Railroads

Chicago

• • • **Initial inquiries** and orders for light weight streamlined trains, with many more expected soon, have hit the railroad equipment market. Chicago Burlington & Quincy has announced purchase of passenger equipment totaling $6,500,000, including two Chicago-Twin Cities Zephyrs, ten high speed diesel passenger locomotives, and a 12-car "Empire Builder." The Empire Builder represents the Burlington's share of five trains to streamline its Chicago-Pacific Northwest service in connection with the Great Northern. The Zephyrs were purchased from Edward G. Budd Mfg. Co. and the Empire Builder from Pullman-Standard Car Mfg. Co.

The new chair and parlor cars will embody glass bubble "vista domes" recently tested on an experimental car.

Orders are expected to be placed soon for three diesel powered light weight trains for the Chicago-Florida run over the Pennsylvania, Chicago and Eastern Illinois, and Illinois Central lines. Ownership, it is understood, will be shared with the southern roads over which the equipment is to operate, the Louisville & Nashville; Nashville, Chattanooga & St. Louis; Atlantic Coast Line; Florida East Coast, and Central of Georgia. Costing $1,500,000 each, the trains will comprise 14 cars with coach and sleeping room accommodations and will be powered by 4000 hp diesel locomotives.

Court authorization has been obtained by Denver & Rio Grande Western to buy three 5400 hp diesel electric four unit freight locomotives and 500 light weight box cars. The locomotives will be purchased from the Electro Motive division of General Motors Corp. for approximately $1,590,000 and the box cars from Pressed Steel Car Co. for about $1,920,000.

The Chesapeake & Ohio Railway Co. has ordered 1500 50-ton steel hopper cars and the Texas & Pacific Railway Co. 25 70-ton covered steel hopper cars from American Car & Foundry Co. Southern Railway Co. has placed 40,000 gross tons of rails with Tennessee Coal Iron & Railroad Co.

Six new Zephyr type stainless steel trains also may be purchased from Edward G. Budd Mfg. Co. for Chicago-Denver-San Francisco service by the Burlington, Denver & Rio Grande Western, and Western Pacific railroads. In seeking court approval of the purchase, Denver & Rio Grande Western indicated that a total of 60 cars would be built at a cost of $6 million. In addition, $3,500,000 would be spent for diesel locomotives. Participation of the railroads in the purchase would be, approximately, Burlington, 41 pct; D. & R. G., 22 pct; and Western Pacific, 37 pct. The trains also would incorporate "astra dome" cars.

Baldwin Locomotive Plans Large Volume Of Export Business

Philadelphia

• • • **The Baldwin Locomotive** Works has a backlog of orders covering locomotives for export and inquiries still in the negotiation stage.

Announcement has been made recently of an order for 16 steam locomotives of the 4-8-4 type for the National Railways of Mexico, the first Baldwin steam power to be ordered for Mexico since 1935. The new locomotives, with tenders, will weigh 316 tons each and will be the most powerful steam locomotives on the lines of the Mexican National Railways. They will be used to expedite the movement of freight and passenger trains on improved schedules. The locomotives will burn oil as fuel and their equipment will include superheaters, power reverse gears, one-piece cast steel locomotive beds and roller bearings.

South American orders include 47 steam locomotives for five different railroads in Brazil, 14 for three railroads in Columbia, three for Ecuador, six for Guatemala and two for Bolivia.

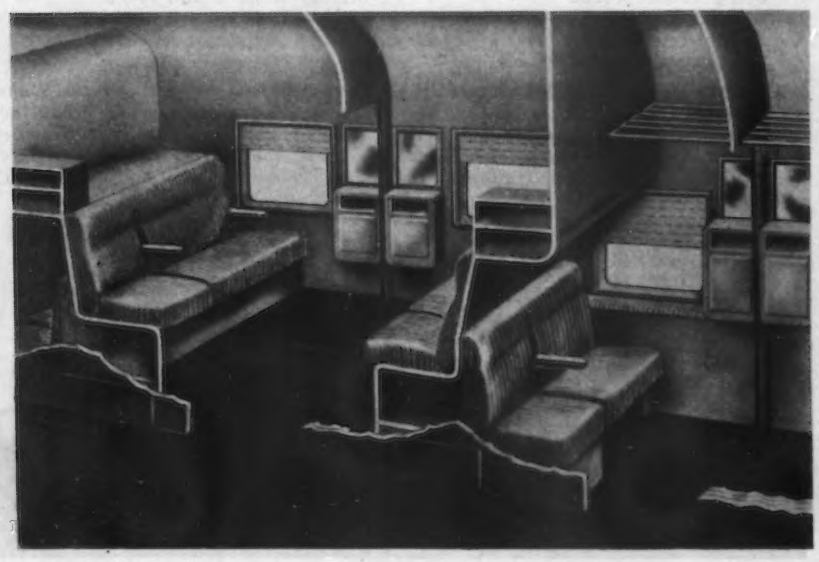
Three locomotives recently completed and six now on order are for export to Mozambique, Africa.

Two 2000-hp diesel-electric road locomotives which were sent to Mexico for trial some months ago, have now been accepted and purchased by the National Railways of Mexico. Four 660-hp diesel-electric switching locomotives have been ordered by another customer in Mexico.

In addition, a total of 30, 660-hp and 24, 1500-hp diesel-electric locomotives are now on order for France and French North Africa, and it will be recalled that Baldwin recently shipped 30 1000-hp road diesels for Russia.

Orders for locomotives which are pending include additional large numbers of steam locomotives for export to South America and other parts of the world.

BUDD'S BUDGETTE—*Edward G. Budd Mfg. Co.'s newest streamlined stainless steel all-room sleeping car, designed to replace the old-style open berth sleeper. In contains 32 single rooms. The company expects construction to get underway by this fall in its Philadelphia plant.*



WPB Steel Division Slashes Paper Work Required from Industry

Washington

• • • As WPB undergoes the process of its own elimination, its Steel Div. is sloughing off time-consuming paper work heretofore required of the steel industry. Relief from this job was given recently when it was announced that a total of 17 reports formerly required from various segments of the industry had been discontinued. Of the 14 reports still required, 10 will be eliminated with reports covering operations in September, one in October, and three at the year end.

In a letter to all steel producers announcing the discontinuance of the reporting forms, Steel Division Director William B. Todd said that for a period it will be necessary to file a new form in which is to be incorporated some of the data now reported on WPB-2633, Report of Shipments and Past Due Orders; WPB-2848, Steel Producers Monthly Production Directive Report; and WPB-3329, Tinplate Inventory Report. The filing of these forms will be discontinued with the reports covering September operations. The new form will be due in the Steel Division Nov. 10, and will cover October shipments and accepted rated orders. It was announced that copies of the new form will be forwarded to steel producers as soon as they are available.

High British Costs Worrying Consumers Of All Steel Products

New York

• • • A sharp wartime increase in the price of steel is proving a major worry for British industries, according to the Canadian Press, which now can look for export business for the first time in six years.

Even a five-year, $540,000,000 program of modernization and expansion in the steel industry is not expected to bring much improvement.

Critics of the British Iron and Steel Federation and its member companies contend the price-change is an argument for nationalization—promised by the Labor Government, although not an immediate prospect.

The steel producers argue, however, that their operations are well managed and that they turn out steel cheaper than comparable American companies. The problem, they say, is not expensive operation but expensive coal.

Before the war, British steel cost 5 to 10 pct less than steel made in the United States; at present it is about 10 pct more expensive. The wartime increase in British steel prices has averaged 36 pct. But in the same period the cost of coal had doubled, until it is about four times as much as American steel producers have to pay, and it takes two tons of coal to make a ton of steel.

There is belief in industrial circles that steel prices in Britain will have to be adjusted upward again before long.

Already the increased steel price is reflected in higher cost of finished products in England. The new automobiles coming off the assembly lines will cost almost double their prewar price, and part of the increase is in steel; the price of ships built along the Clyde is almost double the prewar cost, and again higher steel prices play their part.

The effect is not likely to be seriously felt in the immediate future, when world demand for manufactured goods is certain to exceed supply. Ultimately, however, Britain's ability to compete in world markets against United States steel products may be threatened.

Steel Second in Fluorspar Use

Chicago

• • • Hydrofluoric acid production required more Illinois fluorspar than did the steel industry for the first time in 1944, Dr. M. M. Leighton of the state geological survey reports. He foresees increasing uses for the acid, and also for fluorspar in the glass and vitreous enamel industries.

Discontinued WPB Reports

		Filing Discontinued
WPB-689	Chromium: Stocks, Consumption	Sept. 5
WPB-1583	Structural Shapes—Weekly Rolling Schedule	Sept. 5
WPB-1770	Ferro Alloys: Permission to Use	Aug. 27
WPB-2362	Columbium: Stocks, Consumption	Aug. 29
WPB-2871	Nickel: Stocks, Receipts, Consumption	Aug. 29
WPB-2872	Nickel Chemicals: Suppliers Schedule	Sept. 5
WPB-2933	Alloy Steel Melt Report	Aug. 27
WPB-3452	Cobalt Sales Data	Aug. 29
WPB-3453	Molybdenum Sales Data	Aug. 29
WPB-3454	Vanadium Sales Data	Aug. 29
WPB-3580	Scrap Consumption in Alloy Steel Production	Sept. 5
WPB-3859	Production Service Report	Aug. 31
WPB-3864	Sisal and Jute Quarterly Requirements	Aug. 20
WPB-3867	Wire Rope: Producers Planned Production	Aug. 20
WPB-4165	Tire Bead Wire Shipments	Sept. 5
WPB-4167	Rail, Frog and Switch Requirements	Aug. 31
WPB-4298	Tungsten and Molybdenum Wire Application	Sept. 5

Reports to be discontinued with the report covering operations for Month of

*WPB-970	Steel Forgings Report	September
*WPB-971	Iron Castings Report	September
WPB-1722	Steel Distributors Earmarked Stock	September
WPB-2633	Report of Shipments and Past Due Orders	September
*WPB-2681	Steel Castings Report	September
WPB-2848	Monthly Production Directive Report	September
*WPB-2888	General Steel Products: Distributors Report	September (3rd Quarter)
*WPB-2892	Merchant Trade Products: Distributors Report	September (3rd Quarter)
*WPB-2903	Scrap: Producers Report	December
*WPB-2904	Scrap: Consumers Report	December
*WPB-2905	Scrap: Dealers Report	December
WPB-3174	Pig Iron: Producers Report	October
WPB-3196	Application for Extraordinary Repairs	September
WPB-3329	Tin Plate: Inventory Report	September

* It is understood that a minimum of reporting will be maintained in these fields by other government agencies.

Industrial Briefs . . .

• ASSOCIATION RECONVERTS—The Chicago Association of Commerce's war problems service department has become a reconversion problems department. Formed in 1941 to keep Chicago business abreast of government regulations and war problems affecting postwar programs, the group has conducted more than 225 war problems school sessions and has published numerous bulletins, books and other publications.

• CIVILIAN OUTPUT — Closed down with the announcement that Japan had capitulated, the U. S. Pipe & Foundry Co.'s North Birmingham plant will resume peacetime manufacture Sept. 6. First reconversion production will consist of centrifugally-cast water and gas pipe. The plant had been on war production for three years.

• BUDD RECONVERTS—A two-year $16 million reconversion and expansion program is under way at the Edward G. Budd Mfg. Co. plants in Detroit and Philadelphia. During the reconversion program, $4 million will be spent. The balance will provide sufficient plant expansion to handle an annual sales volume of more than $125 million. Funds for the program were made available through a RFC loan.

• EXPANDING—Monroe Auto Equipment Co., Monroe, Mich., has purchased a large new plant in Hillsdale, Mich., and plans expansion of the company's main factory and another recently acquired plant in Monroe.

• ACQUISITION — Lepel High Frequency Laboratories, Inc., New York, has acquired the Induction Heating Div. of the Van Norman Co., machine tool manufacturers, Springfield, Mass.

• OPENS SALES OFFICE—Robert S. Rose has been appointed district sales manager of the new sales office which has been opened by Latrobe Electric Steel Co., Latrobe, Pa., in Boston, Mass.

• RESEARCH LAB. — Reynolds Metals Co. will construct a $1,000,000 research laboratory on Memorial Drive, Cambridge, Mass., as soon as materials are available. The laboratory will be under the direction of Dr. Warren J. Mead of M.I.T., who has long been associated with research activities of the Reynolds company.

• NEW SALES DEPT. — Dow Chemical Co. Magnesium Div. has organized a Cathodic Protection Sales Department to be managed by Arthur Smith, Jr. His department will handle specialized services connected with the use of magnesium anodes for cathodic protection of pipelines and structures.

• NEW G.M. PLANT — General Motors Corp., of Detroit, announced plans for the erection of a manufacturing plant near Elyria, Ohio, to be occupied by a new division, which will produce hub caps, bumper guards, grills and similar items. The new plant is expected to be in full operation in about a year, and will employ about 2000 persons.

• AUGUST RECORD — Setting a new record for the month of August, 430 new corporations qualified to do business in California, according to Secretary of State, Frank M. Jordan. For the year to date, 2621 have filed, setting the highest average since 1940. Of the August filings 390 were domestic and 40 foreign corporations, setting a total 199 higher than the same month a year ago.

• OPENS SALES OFFICE—Page Steel & Wire Div. of American Chain & Cable Co., Inc., has established a new sales office in the General Motors Bldg., Detroit. E. B. Brant and W. R. Stephens will make their headquarters there.

• MOVES OPERATIONS—Chandler-Evans Corp. has moved all of its operations to the plant of the parent company, Niles-Bement-Pond, at West Hartford, Conn. There will be no change in the separate identity of the products or the company.

Auto Council for War Output Closes Shop

Detroit

• • • **The Automotive Council for War Production is being dissolved as of Oct. 1. It was formerly organized in the closing days of 1941, a voluntary group of automobile companies and affiliated firms, created to implement the nation's defense with the total productive power of the automotive industry.**

The council embraced a total of 654 manufacturing companies, a group estimated to have been responsible for about one-fourth of the national output of weapons and materiel. Membership represented the pooled mass production capacities of all the nation's manufacturers of motor vehicles, in addition to most makers of automotive bodies, trailers, automotive parts and accessories, and the major producers of automotive tools and dies, jigs and fixtures, and special-purpose machinery.

The bulk of its personnel and all of its facilities will revert back to the Automobile Manufacturers Assn., whose activities stood almost completely suspended during the war period.

Evans Co. Buys RFC Plant

Detroit

• • • **Evans Products Co. has purchased the munitions plant built by the RFC for operation by Kelsey-Hayes Wheel Co. at Plymouth, in the suburbs. The purchase price was reported to be about $1,650,000.**

The facility was originally earmarked for the British War Mission. It comprises 330,000 sq. ft., standing on 114.9 acres and includes four buildings and a power plant.

The Evans Co. plans to be in production in the new location within six months, producing mechanical loading devices, airplane seats, domestic heating equipment, and automotive ven-

New ATSC Division Chief

Wright Field, Ohio

• • • **Brig. Gen. Laurence C. Craigie, veteran Wright Field officer, has been named chief of the Air Technical Service Command's Engineering Div. in charge of research development and testing of Army Air Forces' airplanes and equipment. Maj. Gen. Hugh J. Knerr, ATSC Commanding General, has announced.**

AUSTRALIAN SHIPBUILDING: *New yard at Whyalla could build merchant ships up to* 15,000 *tons.*

Australian Iron Ore Mountain Estimated to Contain 100 Million Tons

By GILBERT MANT

Whyalla, Australia

• • • Less than 30 years ago the rumbling of freight trains loaded with iron ore from the fabulously rich Iron Knob, 35 miles inland, was about all that ever disturbed a small desert settlement called Hummock Hill on the western shore of Spencer's Gulf in South Australia. The ore was loaded into ships and taken to Newcastle in New South Wales to be made into the world's cheapest steel. But the average Australian did not know that Hummock Hill existed.

ORE LOADING: *Iron Monarch quarry, Iron Knob, Whyalla, Australia*

Today, what used to be Hummock Hill is Australia's greatest boom town. Its growth since the outbreak of the war has been phenomenal. Most boom towns grow haphazardly and untidily but Hummock Hill is one of the few that were planned. In 1920, it took the new name of Whyalla, a corruption of an aboriginal word, the meaning of which is obscure.

The little desert settlement of a few crude cottages is today one of the busiest industrial centers in Australia, with a population of eight thousand. It has thriving shipbuilding yards, munition works, and a blast furnace.

Whyalla's "iron heart" or Iron Knob, is a fantastic mountain of ore 33 miles away across the desert. Iron Knob is estimated to contain 100 million tons of iron ore above land level. At the present rate of consumption no underground mining will be necessary until the end of the century. The ore is remarkably free of impurities.

The real exploitation of Iron Knob began at the end of 1900 when the South Australian Parliament gave the Broken Hill Co. permission to build a private railway between the ore deposits and Hummock Hill. Until the war started the only activity at Whyalla was the loading into ships of about £2,500,000 ($7,925,000) worth of iron ore a year. The population was a few hundred people.

War transformed Whyalla. Strategically it is one of the safest ports in Australia, being nearly at the end of a gulf somewhat similar to the Gulf of St. Lawrence. The Pacific war accelerated the transformation when Australia, isolated from the outside world, went flat-out on an unprecedented munitions program.

Competitive Bids Return

Washington

• • • Effective immediately greater reliance will be placed upon competitive prices in the awarding of Army contracts, the War Department has announced. The change has been made possible because of the tremendous drop in Army procurement.

Where there is competition for War Department procurement, the chief of the technical service involved will advertise and solicit quotations. While the award of a particular contract will normally be made to the lowest qualified bidder, the War Department reserves the right to award the contract as the result of negotiation and to reject bids.

Steel To Hold Its Position in Postwar Period

. . By THOMAS E. LLOYD . .

Pittsburgh

• • • In crowding ten years of technical development into the four war years, during which time rather strict censorship has been imposed upon these developments, the steel industry will come out of the war into peacetime production with more to offer than might be at first realized. Aside from the technical developments, the expansion in capacity through the addition of facilities based on newer and more modern production concepts, offers a wider variety and greater volume of steel products than ever before. The abundance of steel for unrestricted sale will force upon the steel industry, and the trend has already started, new selling techniques and marketing methods. This healthy and vigorous effort to sell steel, the cornerstone of the American economy, will in turn stimulate business and help maintain a natural prosperity.

The expansion of productive capacity in the steel industry has been paralleled by similar, and even proportionately greater expansion in other industries. Steel's persistent research and development has counterparts in other industries, to the end that large quantities of all types of materials will be seeking peacetime markets as never before. The knowledge and experience gained through research and production of competitive products, immensely stimulated by war requirements, will encourage their expansion into fields heretofore served mainly by steel products. Steel, on the other hand, will have to seek new peacetime markets, too, and will be looking eagerly into every reasonable field of application.

For each application there is usually one best material. Competitive products finding their way into markets usually served by steel will stay there if they can meet the requirements, technically and economically. The material that best serves in any one certain application will stay there or regain its position if it has been temporarily displaced.

Economics, physical characteristics of materials, and markets are interrelated, but of these, economy of use is the ruling factor in mass markets. All civil applications of materials are necessarily based upon economic considerations. Economy of use will be the determining influence following the war. If two materials are equally suitable from an engineering standpoint, the least expensive will be used.

Low cost has always been a fixed characteristic of steel. Competitive materials may approach steel in other characteristics for special applications, but none seems to be about to take the place of steel as the lowest cost material. Obviously, any narrowing of the spread in prices between steel and other constructional materials may reduce steel's usual advantage. It is not anticipated, however, that price differentials will be reduced to the point where steel can be displaced economically in the large industries by the light metals, aluminum and magnesium, despite differences in unit weights. Admittedly they are light, but they deflect more than steel of the same section under load because of their low modulus of elasticity. Hence, in the design of structures, full advantage of their relatively low density cannot always be realized.

Calm technical and economic appraisal of claims will show that materials competitive to steel have good properties, but they likewise have shortcomings and handicaps. Some materials, for example, are organic and cannot serve at high temperatures. Others can hardly be considered formidable contenders in structural applications because of their low strength and high cost. Certain metals, for instance, are none too resistant to the effects of heat, even below the red range. In addition to the relative cost, many factors such as workability, strength, weldability and resistance to wear raise questions which must be answered in individual cases before a material can be approved.

In commenting marketwise on competition from aluminum, magnesium, and plastics, L. S. Hamaker, assistant general manager of sales for Republic Steel Corp., recently stated that he did not believe the steel industry will suffer to any considerable extent after

• • • This is the third of four articles dealing with the postwar production and marketing aspects of aluminum, steel, and magnesium. The first appeared in THE IRON AGE on Sept. 6, p. 129; and the second on Sept. 13, p. 102. The remaining article, written by Wysor Brown, vice-president and general manager of the American Magnesium Corp., will deal with magnesium and will appear in the Sept. 27 issue of THE IRON AGE.

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STEEL'S NO. 1 CUSTOMER: *Reconversion has already supplanted war output in Detroit's automobile plants, and the rush is on to get steel. This 900-ton press forms auto body panels, the greatest single use of steel sheets.*

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the war because of these materials. He expects that between 33 and 34 million cars will be in service soon after the war is over; and points out that estimates have been made stating that as high as 1,000,000 new homes a year for ten years.

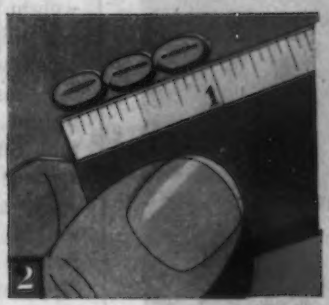
Further, railroad, farms, highway construction, and consumer markets will provide huge markets for steel. However, he also points out that there is little possibility that full steel capacity can be fully employed for a good many years after the war, no matter how good business is. One further possibility is that England and the United States will share in an enormously expanded world demand for steel, not only as raw material, but in machine tools, motors, industrial equipment, railroad facilities and agricultural equipment. Export markets should absorb a far higher proportion of American steel output than ever before.

The light metals, plastics, rubber, wood, wood products and glass are competitors of steel of ever increasing importance. These materials, in one way or another, have displaced steel in many applications because their peculiar merits countered steel's low cost. It can be expected that they will be used likewise in place of steel in many applications beyond the present horizon. The steel industry, therefore, will ceaselessly pursue improvements in quality, type, and design to maintain its predominant position. Steel has kept ahead, and will strive to maintain or lengthen that lead. An example of this trend can be shown in the transportation field.

When emphasis was put on the need for lightness of weight of structures and elimination of the useless cost of moving deadweight from place to place, as in railroad freight and passenger equipment, the steel industry developed an entirely new series of low alloy high strength steels. These higher strength steels made possible the use of less steel per unit of strength, thus permitting the desired reduction in weight without sacrificing safety. The greater corroson resistance was equal to what was required to provide the same or even longer service when the steels were used in the lighter sections. The low cost of these better products led to wide acceptance by many industries, particularly the railroads. For example, today the railroads are operating 53,981 freight cars and nearly 1800 passenger cars built of the grades of steel produced by just one steel manufacturer. This producer has

What's a cubit? Ask any old Egyptian!

Egyptians measured by *cubit*—length of a human forearm.



In 1324, England figured three barley corns made a fair *inch.*

In 1500, the left feet of any 16 Englishmen totaled a *rod.*

From King's nose to fingertips was a *yard* in medieval France.

In 1875, the *meter* was adopted to aid standardized production.

Next came *master gages* for closer dimensional control.

By 1930, *gage* accuracy made parts fully interchangeable.

Ring type gages are accurate; Roll Snap Gages speedier.

Woodworth's LIMITROL Gage combines best features of both.

Inexperienced inspectors use it with speed and accuracy.

If a part passes the LIMITROL, it will assemble.

Industry lauds LIMITROL'S accuracy and high capacity.

What Woodworth Accuracy Means to Production

WOODWORTH, to industry, is another name for *precision*—precision gages, precision tools, precision machined parts.

There is a reason for this.

Every Woodworth product must conform to the basic policy of this company . . . *to make only products which will benefit industry through increased production and reduced costs.*

This means that the great demand for Woodworth Tools and Gages will be continuing, especially in view of the coming battle for postwar markets.

And it means that Woodworth engineers have been charged with the responsibility of searching constantly for new ways to speed up and lower the cost of production, in connection with Woodworth products of the future.

The constant growth and expansion of the N. A. Woodworth Company is due to strict adherence to these objectives.

ACCURACY YOU W CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD, DETROIT 20, MICHIGAN

PRECISION GAGES

PRECISION MACHINED PARTS

PRECISION TOOLS

also supplied low alloy high strength steels for 1200 street railway cars now operating in American cities.

It is evident, then, that lightweight construction does not necessarily stem from materials that are light in weight per unit of volume. Lightness per unit of strength at low cost combined with careful design will allow the mass industries to reduce surplus weight at little or no extra cost over that for ordinary steel.

Since the field of transportation offers the greatest sphere for lightweight construction at low cost, it can be anticipated that producers of light metals will seek markets for their products in, to name just two, the railroad and automotive industries. Steel has not had these industries to itself. Aluminum and other materials have been used to some extent, but steel continues as the work horse because its characteristics and low cost are admirably suited to mass production. It is not inappropriate, then, to consider some of the current thinking about the market possibilities of those materials that will have a direct bearing on the displacement of markets for steel.

The manyfold expansion of consumption of aluminum to nearly 1,250,000 tons in 1944 as compared with an annual of 130,000 tons in the 1935 to 1939 period, is sufficient evidence of the broadening of this industry and the direction it will take in the postwar years, despite the fact that average annual finished steel consumption jumped from 31,000,000 tons in the same years to nearly 67,425,000 tons in 1944.

The recent book, "Aluminum: An Industrial Marketing Appraisal," by Engle, Gregory, and Mossé, gives an estimate of the postwar consumption of aluminum, reached by the fifth postwar year, of approximately 715,000 tons, with virgin aluminum ingots at 15¢ per lb. This price is stated to apply to pure aluminum ingots, with the price of aluminum alloys, as generally used, somewhat higher. Of the estimated tonnage, they figure that automobiles will consume 200,000 tons of virgin and secondary aluminum, as compared with an annual average of 12,000 tons of virgin aluminum and an unstated quantity of secondary aluminum consumed during the prewar years, 1935 to 1939.

The automotive industry bought directly from the steel industry during this same period an annual average of 5,800,000 tons. The total steel used by the industry was much greater because the tonnage shipped

THESE UNITS CUT COSTS

They are basic features of the TURNER SYSTEM OF MATERIALS HANDLING

Removable Shell Racks fit on movable Transports, ready to be moved with hand "Jimmy," power lift truck, crane, tractor or conveyor.

Many of America's largest manufacturers are now using the Turner System to cut labor cost, reduce floor space, reduce equipment cost. It SHOULD be good — AND IT IS! It can be applied to every plant operation. It is worth looking into.

Confusion is the enemy of profit. Consider what it would mean to your plant to have everything in perfect order — yet instantly available for transportation to any part of the shop. The Turner System will do the trick.

Grid Deck Transport provides point contact with hot materials. Non-skid embossments hold materials on deck.

"DELIVER THE BIN AND SAVE THE HANDLING"

Steel or Wood Bin Sections fit one on another on the several types of Turner Transports to make any size bin desired. Heavy loads are easily moved with the Turner Jimmy.

BIN SECTIONS ON TRANSPORTS

The Turner System provides an unlimited variation of co-ordinated accessory units, all readily movable on the Transport, to meet any storing or handling problem.

60 DAYS FREE TRIAL

We are so sure that you can benefit from the use of this system that we are willing to ship an assortment of standard units for 60 DAYS FREE TRIAL. Use them for at least two months. Keep them if (in your opinion) they save labor, time and space. Return them if they don't. There is no obligation except that you assume nominal transportation charges.

THIS BOOK WILL EXPLAIN THE TURNER SYSTEM

You can get a complete outline of the Turner System in a twenty-page book sent to established companies. Write on your letterhead for your copy.

Steel Bin Sections fit on Grid Deck and other Transports.

Wood Bin Sections may be removed as load diminishes, added as load increases.

FACTORY SERVICE COMPANY

4621 NORTH TWENTY-FIRST STREET — MILWAUKEE 9, WISCONSIN

directly does not account for shipments to fabricators who produced automotive parts.

A prominent automotive engineer reported to the Senate Small Business Committee during its recent study of light metals that a 1942 automobile required just a little over 6 lb of aluminum. Several months ago one of the executives of a large automobile company indicated that there will be little change in the relative quantities of steel, iron, aluminum and magnesium for passenger car construction during the postwar period as compared with prewar construction.

The use of light metals in the postwar car for parts like cylinder heads, cylinder blocks, crankcases, flywheel housings and transmission cases will encroach on the markets for cast iron, but not on those for steel.

The continued use of aluminum by the bus industry is anticipated, but some of the market should revert to steel. When aluminum became so critical early in the war, a bus manufacturer completely redesigned a motor coach and put into production a 37-passenger steel motor coach weighing 2000 lb less than the equivalent 22,000 lb aluminum coach.

The consumption of aluminum by the railroad industry at the end of the fifth postwar year is estimated by Engle, Gregory and Mossé to be a little over 180,000 tons. Shipments of steel direct to railroads and carbuilders averaged about 2,700,000 tons annually during the prewar years 1935 to 1939, not including shipments to fabricators of parts for cars, locomotives and other equipment.

A railroad hopper car of 50 tons capacity was recently built of aluminum and steel, with a finished weight of 41,430 lb. High strength steel hopper cars of 50 tons capacity built in 1935, weighing 30,500 lb, have been in satisfactory service for nine years. The high strength steels have also permitted drastic reductions in weight of passenger equipment with little increase in cost. Main line passenger coaches formerly weighed about 80 tons. High strength steel cars with the same seating capacity average about 55 tons, or a saving of 25 tons without sacrificing car life or safety. Likewise, stainless steel is admirably suited for railroad passenger equipment and will not be displaced by light metals with any degree of ease.

In freight equipment, it has been stated that there are great savings due to the reduction of weight brought about by light metals. One producer

estimates savings in operating expenses, before fixed charges, of about $25 annually per ton of weight reduction, but after fixed charges are taken into account the saving turns into a loss.

Of two lots of dining cars built for an eastern railroad, high strength steel cars weighed 113,240 lb and cost $78,550 while aluminum cars weighed 113,300 and cost $88,150. This is a direct comparison because both lots were required to meet the same requirements concerning load, deflection, and other engineering factors.

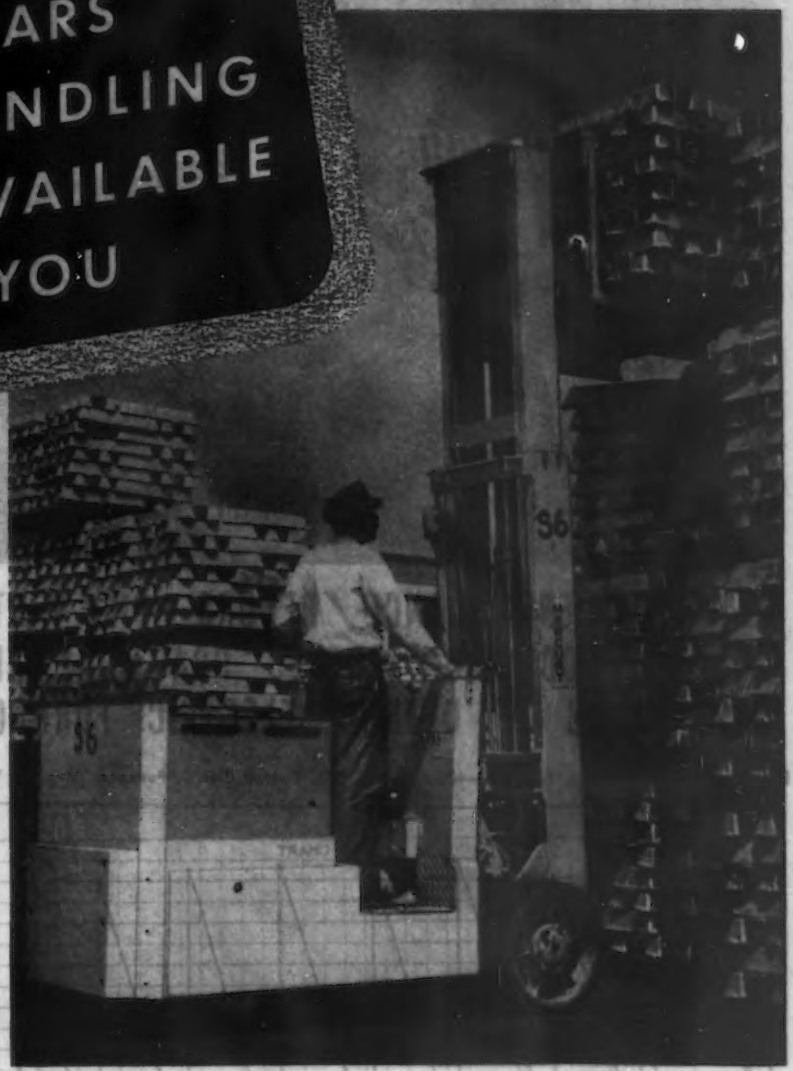
Plastics, magnesium, plywood, timber and glass have been developed to a remarkable degree during the last few years. They must be viewed, in the light of increasing usefulness, as products that will displace customary materials. Some of them have suitable physical characteristics for certain structural purposes. Comparative cost rules against others. Plastics, in the present state of their development, probably will not be used to an appreciable extent for structural purposes. The average passenger automobile before the war contained about 7 lb of plastics, approximately 2 lb of which might have been steel. The average postwar car may contain more than this amount, but through the displacement of nonferrous metals rather than steel. Steel had been displaced years ago by nonferrous products for certain applications and this extended use of plastics cannot be regarded as an encroachment on steel's postwar markets.

The present high cost of magnesium will militate against this material in comparison with steel, although it may displace certain nonferrous products and some castings. Annual capacity is reported to be in the neighborhood of 350,000 tons, of which about 94 pct is government owned. The officials of one large producing company stated that they believe the country will use about 32,000 tons annually by the fifth postwar year.

Timber, the oldest structural material, is expected to continue as a principal competitor of steel, particularly for the building of static or temporary structures, largely because of the comparative ease with which it can be worked. The exciting development of wood and wood products during the period of metal scarcity forecasts the importance of these products in coming markets. Wood commands, and in turn, should receive considerable respect for its notable characteristics and future possibilities.

Plywood and combinations of metal

OVER 35 YEARS MATERIALS HANDLING EXPERIENCE AVAILABLE TO HELP YOU



Lower Costs through improved Handling Methods

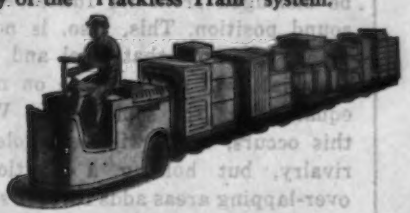
Here is what MERCURY'S extensive materials handling experience can mean to you:

. . . the development of a sound and efficient handling system. In helping hundreds of organizations to install handling equipment, MERCURY has accumulated a wealth of experience that may be applied to your individual problems.

. . . provide you with the finest equipment. As a pioneer in the materials handling field, MERCURY has had over 35 years' experience designing and manufacturing handling equipment. This experience is engineered into every MERCURY product.

By way of illustration, the following are but a few of the important contributions Mercury has made to the materials handling field:

1. Originators of the "Trackless Train" system of materials handling. The fact that thousands of Mercury tractors and many times that number of Mercury trailers are serving throughout industry is evidence of the popularity of the "Trackless Train" system.



2. Mercury has pioneered and perfected many important industrial truck features. Those illustrated are standard on all Mercury fork trucks. While these features vary slightly on Mercury platform trucks, the basic principles are the same—

Hydraulic Hoist: No power required to lower load, no power wasted in lifting. Less than 50% of the usual moving parts.

Snap-action cam operated controller: Eliminates injurious arcing. Reduces maintenance to the minimum.

Unit constructed drive assembly: Motor and drive are one unit. Double reduction spiral bevel and spur gears transmit maximum power.

All welded frame: No rivets to weaken sections. Exterior is smooth and pleasing in appearance.

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MERCURY
TRACTORS TRAILERS • LIFT TRUCKS

and plywood have made great strides in very recent years. When used in conjunction with steel, plywood serves largely as a sound-insulator and also as a stiffener for large, flat panels. New adhesives and impregnating materials are expected to open new fields of use. It is difficult at present to anticipate the extent of the displacement of flat rolled or structural steel by plywood, or metal and plywood combinations. Material of this kind, however, may be relatively high in price and economics will dictate the final choice.

Glass will probably come into increased use for certain structural purposes, but it is not likely to displace appreciable quantities of steel without further development of means of joining and fastening.

All materials suggested for use in the mass production industries must be capable of being fabricated into the finished parts by mass production processes. When the choice finally lies between materials reasonably comparable as to physical and chemical characteristics, economic laws will require the use of the less costly material. Steel will give way here and there to competitive materials, but by and large, its low cost for ever-increasing quality will assure substantial continuing participation in the major markets.

If a product has sufficient merit, it will command markets where its application is logical and economical. The product must necessarily contribute to progress to keep its place; otherwise, it is economic waste. In this respect, steel's contribution to progress is almost incapable of measurement. The very desire on the part of the steel industry to continue the improvement of its products recognizes the persistent need for better and better materials. Steel will not be dislodged from its fundamentally sound position. This, also, is not intended to imply that steel and other materials will not compete on nearly equal terms for some uses. Where this occurs, there will be wholesome rivalry, but holding a position in over-lapping areas adds further stimulus to the production and marketing.

Last year, a prominent steel producer summarized steel's competitive situation when he stated: "While interproduct competition lies ahead and is not to be dismissed as inconsequential, steel is by nature well equipped to make a case for itself, if its sponsors do not become afflicted with an unwarranted feeling of timidity."

Making Surgical Instruments of Stainless Steel

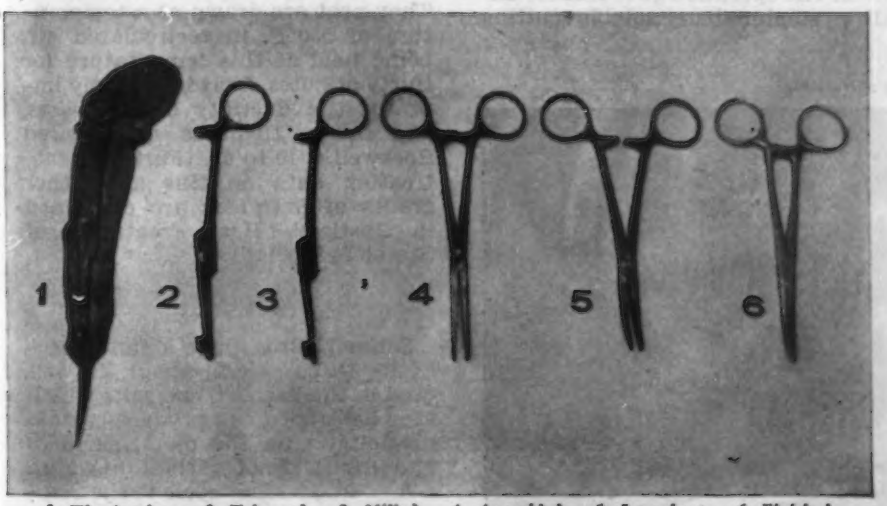
A report on one manufacturer's methods of forging, heat-treating and finishing small STAINLESS STEEL parts

STAINLESS STEEL which is to be made into surgical instruments of carefully controlled qualities needs extra care in heat treating. Inspections likewise must follow more of the production operations than is usual with ordinary "carbon" steels. With these precautions and a few changes in procedures STAINLESS STEELS can go down the same production line as ordinary steels. Elimination of plating is a great advantage to both the fabricator and the user. Such is the experience of Schnefel Bros. Corporation, Newark, N. J., makers of the famous "La-Cross" instruments.

The STAINLESS STEEL itself, of course, must be made with utmost care, the way it is made by Rustless Iron and Steel Corporation. Any lack of uniformity in the steel can cause trouble along the fabricator's production line by yielding irregular response to standardized heat-treating and finishing procedures. In the first lots of STAINLESS STEEL to be fabricated and continuing whenever minor troubles occur or changes in procedures are made to improve results and reduce costs.

The first production operation in making artery forceps, for example, is slitting. Most surgical instruments are pointed; therefore, when flat bar stock raw material is used it is slit diagonally instead of being cut off square thus providing two pointed ends simultaneously. When round stock is used it is generally forged off the end of the bar.

The hot forging operation follows. Forging is done on small (500 to 800 lbs.) board drop hammers. The operator is able to raise the hammer to various heights and therefore to strike blows of varying forces. He can vary the number of hammer blows applied to each piece, being careful not to fold or wrinkle the metal. Generally he finishes each piece with three or four full blows;



1. The forging. 2. Trimmed. 3. Milled. 4. Assembled. 5. Jaws bent. 6. Finished.

fact, the proper grade for surgical or dental instruments and similar devices is one which must consistently produce a hardness of Rockwell C 40 to 45 following a prescribed heat treatment. Important also is sales engineering service such as is given by Rustless. This service is periodic, beginning with any greater number may permit the steel to cool too much and result in hardening. This particular grade of STAINLESS is drastically air hardening when cooled quickly from above 1500°F.

Trouble at the hammers is readily avoided if the correct heating method is used. STAINLESS STEELS must be heated to slightly higher forging temperatures than carbon steels and must be struck harder blows. The operator who is used to judging carbon steel temperatures "with his eye" may go wrong on STAINLESS temperatures. Schnefel finds it entirely satisfactory to use an optical pyrometer to check this several times every day while some other shops prefer a recording pyrometer. The material is heated to between 2100°F. and 2200°F.

Controlled Soaking

A heating and soaking period of about five minutes is necessary, depending upon the stock size. And this also must be controlled. Too short a soak means poor forging, too long means excess scale which will be beaten into the surface of the metal by the hammer and cause indentations which increase the costs of polishing.

An average forging time cycle for each kind of instrument part is used to control the heating and soaking time. On one part, for example, it takes ten seconds for the operator to put a cold piece into the furnace, take a heated one out, do his forging, plunge the forged piece into a refractory material and pick up another cold piece. Since a five-minute period contains 300 seconds, the keeping of 30 pieces in the furnace at all times and taking them out and replacing them in rotation will result in a five-minute heating and soaking period for each.

Slow Cooling

The pieces as lifted from the dies are at about 1600°F. They are buried immediately in the refractory material so they will cool slowly as otherwise they might strain crack. As a rule they are left to cool below 300°F.

After being removed from the refractory material, the pieces are

The furnace with the drop hammer at work.

pickled in full strength commercial muriatic acid, or the solutions recommended on Pages 40 and 41 in Rustless' booklet "Heat Treatment of Stainless Steels," to remove the forging scale.

Annealing at Schnefel Bros. is in sealed 35 nickel, 15 chrome pots placed in a Hones atmospheric-type furnace. Four hours' time is used to bring the cold pots up to 1600°F. to 1650°F. The pots are held at that temperature for at least one hour. Cooling is by easy stages. With heat kept on the furnaces the pots are allowed to cool not more than 200° in the first hour and 200° more in the second hour, and cooling will be slower than this if the parts had been harder than Rockwell 25C. But when the pots are down to 1200°F., the heat is turned off and the pots are allowed to cool in the furnace for the remainder of the annealing period.

Rockwell Test

The parts are pickled again to remove the light scale and then hardness tested. A hardness of Rockwell B90 Max. is aimed at as this is excellent for machining. To remove any remaining forging and annealing scale the parts are tumbled overnight. Tumbling imparts a rough polish. The parts are inspected again for any pits or faulty surfaces or other defects which might make further operations inadvisable. Nearly all pass inspection and are sent to the secondary operations departments.

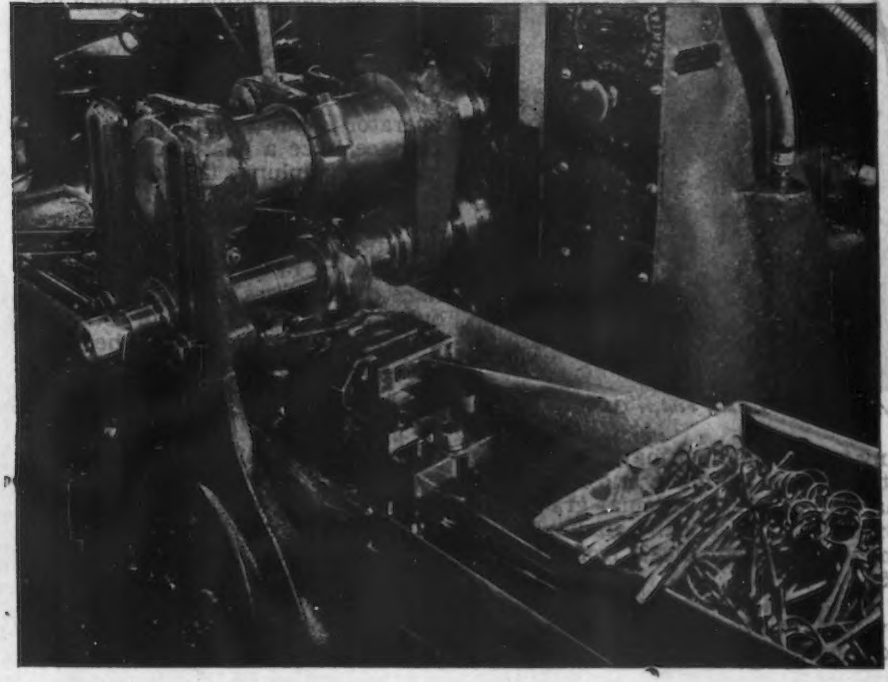
Secondary operations include trimming in punch presses, cold pressing, drilling, rough grinding, shaping the blades, and some spot welding in the case of tweezers. There are no important deviations from the processes applied to carbon steels except that the forging flash may be removed from carbon steel parts by cold punching before annealing but in the case of STAINLESS STEEL the flash is removed after annealing. Milling of the STAINLESS STEEL is about 15% slower than that of carbon steel and the milling cutters have from 30% to 40% shorter lives. The operation gave trouble until a sulphur-base soluble cutting oil recommended by Rustless Iron and Steel Corporation engineers was used.

Trimming off the flash.

Final Heat Treatment

After the secondary operations Schnefel gives the parts their final heat treatments. They are heated to 1825°F. in free rinsing salt, held for a 5-minute soaking period and quenched in low viscosity quenching oil. Rockwell testing follows the rinsing of the quenching oil in alkali cleanser and hot water. The parts now must show a uniform Rockwell hardness of C 47 to 50. They next are drawn at a temperature of 550°F. in recirculated air, being held at this temperature for thirty minutes. Drawing greatly improves the ductility of the parts, and brings them to the desired Rockwell C 40 to 45. (Further heat-treating data on this and other grades of STAINLESS are contained in Rustless' "Heat Treatment of Stainless Steels.")

One of the milling operations.



Salt Bath

Schnefel Bros. have found it necessary to be careful about the salt used in the baths. Some salts which they have tried can produce barium precipitates on the metal surfaces and these will not wash off in water.

A short pickling cycle is then applied prior to grinding to remove the slight scale resulting from heat treating.

The final operations such as pointing, shaping, buffing, assembling and final polishing are done by skilled craftsmen.

It is here that the rewards of careful control in inspecting and heat treating are found.

An operator buffs a piece largely

its "feel" against the wheel, but at will tell him very little if he es not know exactly how his ma- ial will behave. Shaping and inting the instruments—a buffing d hand-grinding process — is ged somewhat by visual inspec- n but mostly by the feel of the ecisely tempered STAINLESS STEEL. e all-important "setting up" op- ation, getting the blades to meet ctly right and with precisely the ht amount of friction at the nts, making sure that ratchets ich are to hold instruments at act pressures on arteries of the man body will hold just right but ll not stick, is a matter of know- g exactly how the instrument ould feel and of being sure that it feels right it is right.

Nitric Acid Passivating

Passivating, to remove the last aces of foreign material and forti- the natural passive surface film areas inaccessible to the buffing heel is the last operation before a al light buff. A solution of 18— % nitric acid at 110°—120°F. is ed.

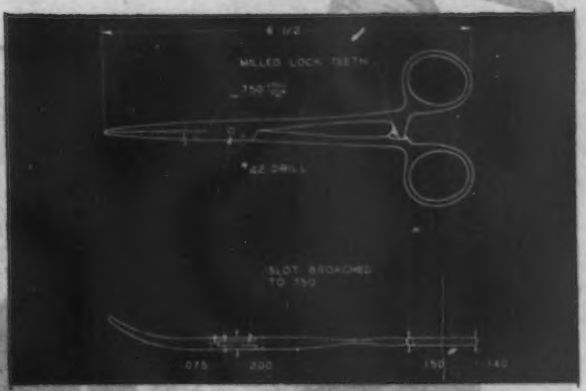
There are tests which the instru- ents for the Government must ss. One of them is the "blue stone," nother the "boil." In the blue stone st the parts are submerged for 6 inutes at room temperature in a andard solution of copper sul- hate, sulphuric acid and water. The arts must show no plating-on of pper. (Government Specification -1-3.)

Boil Test

In the boil test the parts are eaned with soap and water, dipped in alcohol, dried in an oven or wiped dry, submerged in still water, brought to a boil, boiled for thirty minutes and then allowed to remain submerged for 24 hours. Not more than 2% of their surfaces (visual estimation) may then show any discoloration.

These tests are standard. But for the real test, no standard can be laid down. The real test is the way the instruments feel in the hands of a surgeon or a nurse while working against split seconds of time to save a human life in a hospital or on a battlefield. It is a real tribute to American manufacturers that a tremendous number of satisfactory instruments were made during the war when many, unlike Schnefel Bros., had had little or no previous experience in the field.

That exactly right, completely dependable "feel" is put into their splendid instruments by the careful heat treatments, inspections, and workmanship of Schnefel Bros. But behind it is the equally careful work of Rustless Iron and Steel Corporation. It is a strange fact, but success in the operating room starts in the steel mill.



Salt bath hardening. Note nearness of quench tanks.

Finishing on the wheel.

Rustless specializes in STAINLESS STEELS, and through long, concentrated study and experience has learned how best to forge, heat treat, machine, electropolish, and otherwise fabricate STAINLESS into products of enduring beauty, cleanliness and economy. All our knowledge is at your command. Our engineers will gladly work with your production men. The authoritative Rustless booklets are free. The one mentioned in this advertisement, "Heat Treatment of Stainless Steels", containing 56 pages and 9 Data sheets will be sent on application.

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RUSTLESS IRON AND STEEL CORPORATION

BALTIMORE 13, MARYLAND

New York City Assn. Finds Pertinent Data On Reconversion Needs

New York

• • • A survey of the reconversion situation in the New York area, still under way by the Commerce and Industry Assn. of New York, shows to date that (1) New York is in a relatively better position than most cities because of its leadership in consumer goods; (2) more than 40 pct of the firms thus far contacted are seeking larger quarters ranging from 15,000 to 100,000 sq ft; (3) most firms have arranged special programs for hiring and training veterans; (4) in some cases where employees have been laid off, men will be rehired in place of women.

The facts uncovered to date by the survey are revealed by Thomas Jefferson Miley, secretary, in the following report:

"One main fact has been lost sight of in the welter of last week's releases under the heading of reconversion. Business is not reconverting back to any previous peacetime production level. Instead, business is really expanding to a new and higher level of peacetime production than was ever possible under prewar conditions.

"A special effort was made in this survey to contact typical New York business firms representing the city's 30 major industry groups. These firms manufacture such items as shoes, leather products, electrical appliances, photographic equipment, radios, transformers, cosmetics, machinery, surgical appliances, laundry equipment, metal products, furniture, printing and book binding, plastics, musical instruments, clothing, building and construction, hardware and such service industries as warehousing, metal supplies, wholesaling, retailing and accountancy and banking were also contacted.

"Approximately 75 pct of these firms were engaged in war work, either as prime or subcontractors. The majority of the products manufactured by them were not their regular peacetime products. Better than 75 pct of the firms interviewed have received contract terminations since VJ-Day, amounting to from 50 to 100 pct of their total war orders. These firms pointed out that the main problems to be faced under reconversion were as follows: 65 pct said that they were not experiencing any difficulty locating raw materials and that while

Better Results

WITH

Follansbee

CLAD METALS

Silver, Copper
Copper Alloys on Carbon or Alloy Steels

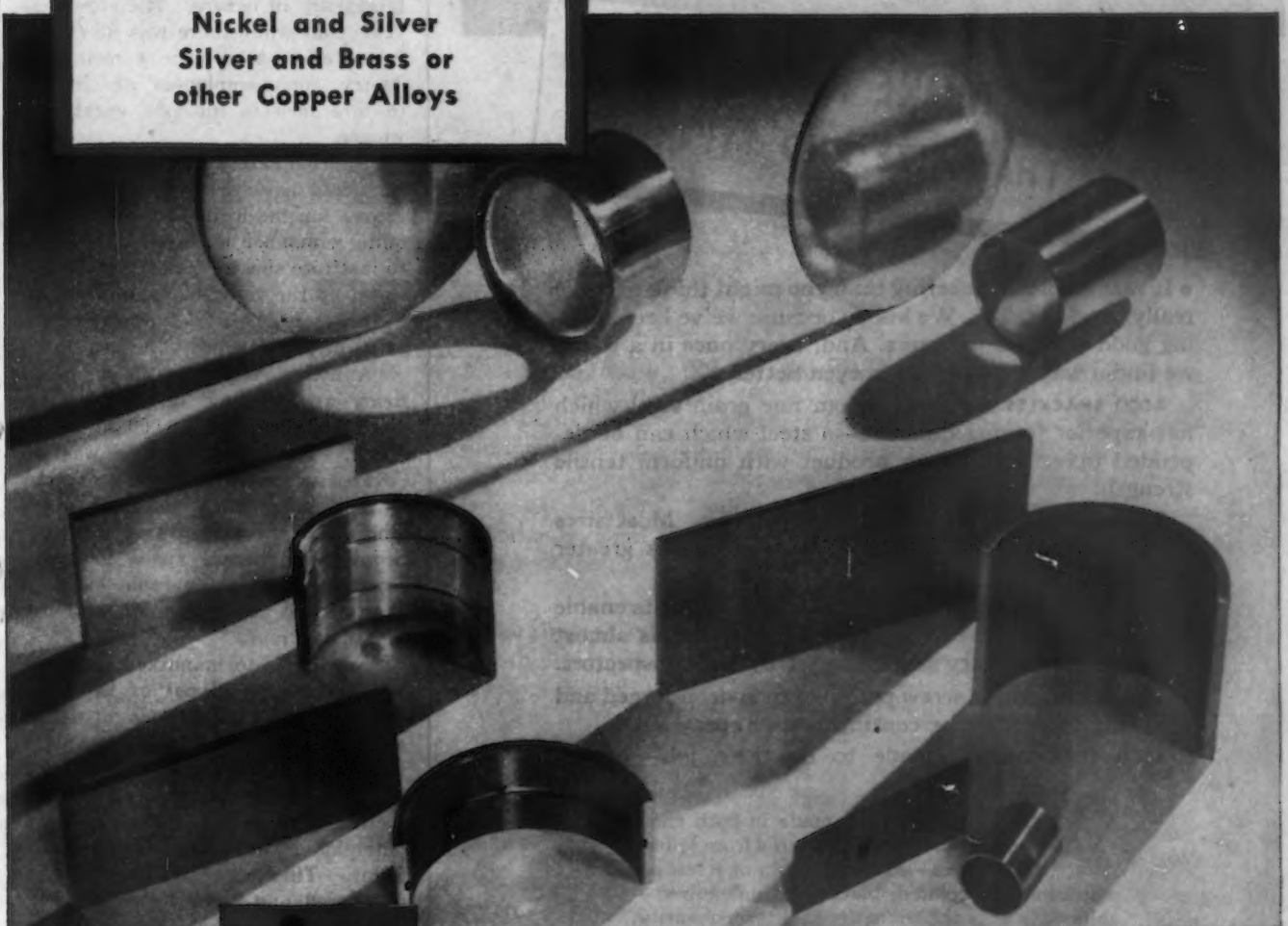
Stainless Steel on Copper or Steel

Other Combinations
Nickel and Silver
Silver and Brass or other Copper Alloys

BEARINGS are but one of numerous products for which Follansbee Clad Metals provide highly desirable characteristics. Leading manufacturers of bearings, for example, are using Follansbee Silver and Copper Clad Steels to increase capacity and fatigue life. These bearings are performing superlatively under the severe conditions imposed by aircraft, automotive and marine engine use.

These and other combinations of Follansbee Clad Metals offer excellent potentials in such widely diverse products as Cooking Utensils, Electrical Contacts, Chemical Mixing Vats, Industrial Heating Vessels and Heat Exchangers.

If you are interested in exploring the possibilities of improving your products through the combination of two or more metals, you are invited to make use of our Clad Metal facilities. Just direct your request to our General Offices.



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POLISHED BLUE SHEETS • ELECTRICAL SHEETS & STRIP • SEAMLESS TERNE ROLL ROOFING

the labor supply was still tight, they expected this to clear up.

"War Production Board regulations present no obstacles at the present time. Their main worry is for an immediate clarification of the OPA pricing regulations and a speeding up of the issuance of price ceilings. A number objected to the OPA's policy of having the retailer absorb price increases given to the manufacturer and wholesaler. They pointed out that the retailers' cost of operation had increased in proportion to that of the manufacturer and that the question of a larger volume offsetting the cut in profit margins was still too far off to be safely gambled with.

"The majority of firms optimistically anticipated an approximately 25 pct larger work force by January 1946 than at the present time. Where employees have been laid off, in most cases, these layoffs were considered temporary in nature. The survey reveals that while there was no concentrated effort to replace women in industry, some employers are inclined to hire men to fill jobs vacated by women.

"Approximately 85 pct of the firms contacted have arranged special programs for the hiring of veterans. In quite a number of cases they expect to institute special training courses to speed up the veteran's adaptability to his new job. This is especially true of cases of handicapped veterans.

"A little better than 40 pct of the firms are seeking larger quarters, space ranging from 15,000 to 100,000 sq ft. Only one instance was uncovered where the company expected to reduce the size of its plant. Many, who under the pressure of war work acquired additional space in widely separated and unfavorable locations, are anxious to get their activities under one roof.

"New items to manufacture are being sought by 70 pct of the firms. A campaign of hundreds of letters and numerous advertisements placed in the country's leading newspapers have produced many requests for local facilities, either as subcontractors or outright manufacturers of various items. This program thus far has uncovered one large New York City manufacturer who requested the names of as many metal stamping firms as the association could supply, to handle large volume orders on file cabinets, card boxes, etc. Today's mail produced a request from a Detroit manufacturer for a plant to manufacture kitchen cabinets.

"Wholesale distributors as far west

GUM STUCK THIS PLANT FOR PLENTY

SUN HYDRAULIC OILS . . . Ended Valve-Sticking in Hydraulic System of Milling Machine. Saved about $360 a Year Per Machine

Often, small changes permit a plant to increase its efficiency, to save money, and to eliminate costly "time-out" periods. This is especially true in specifying petroleum products, for each lubricant or oil must meet the particular requirements of a particular operation. For example:

A manufacturer was machining forgings on a big milling-machine, and ran into trouble with the oil in the hydraulic system that operated the machine.

Valves stuck, and gum had to be cleaned out at regular intervals. Production was being slowed down, and men were wasting valuable hours in cleaning-up machinery.

Gum vanished, and valve-sticking stopped after a Sun Oil Engineer was called in and recommended Sun's Solnus Oil. The oil met the requirements of the job and had to be "added-to" only once in five months. Maintenance-men were no longer tied to this machine. Savings were estimated at about $360 a year.

Wherever oil is used in your plant, whether in hydraulic systems, in machine-tools, in processing textiles, rubber, leather, or other materials; or for lubricating machinery, every oil should be fitted to its particular purpose—the right oil should be put in the right place. Let the skill, experience, and know-how of Sun Engineers help you solve your problems. Just write or call your nearest Sun office or . . .

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SUNOCO SUN INDUSTRIAL PRODUCTS
OILS FOR AMERICAN INDUSTRY

as California have requested the association to locate for them manufacturers of the following products: Washing machines, radios, irons, toasters, hot plates, food mixers, heaters, mufflers, clutch plates, tire pumps, oil filters, jacks, drills, planes, hammers, screw drivers, work benches, cutlery."

The association's reconversion program is a continuation of the work of its War Contracts Div., which helped bring millions of dollars worth of war work to local plants during the last three years.

Mr. Miley pointed out that manufacturing is not the only large industry of New York City.

Course to Be Given In Quality Control

Iowa City, Iowa

• • • An intensive ten-day course in "Quality Control by Statistical Methods" has been announced by Dean F. M. Dawson of the College of Engineering and chairman of the committee on quality control, and by Dean Earl J. McGrath of the College of Liberal Arts at the State University of Iowa. The course will be given November 6-16 inclusive at Iowa City, Iowa.

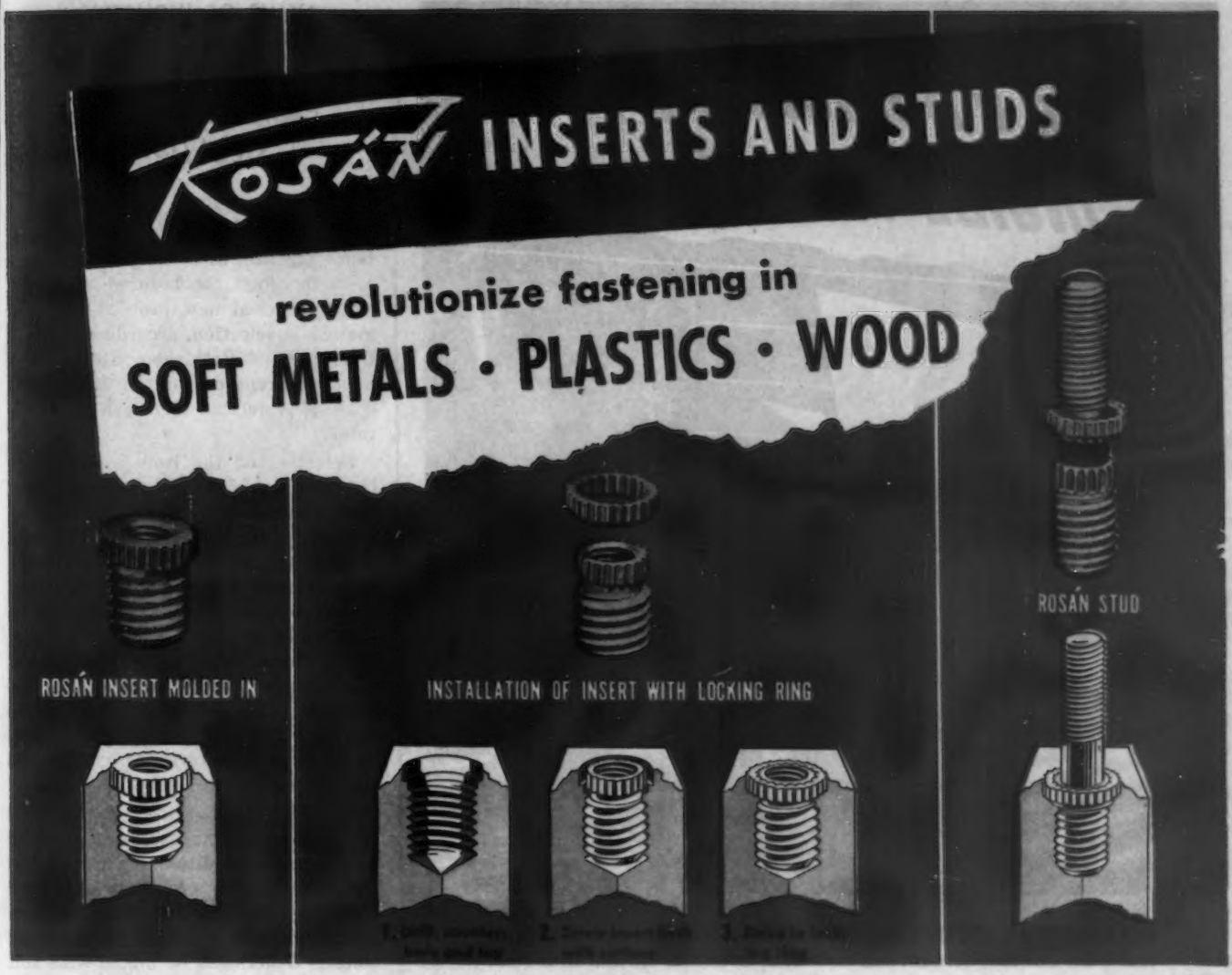
The University of Iowa has cooperated with the War Production Board and the U. S. Office of Education under the E.S.M.W.T. program in giving similar courses in quality control by statistical methods. Over 70 representatives of industry from eight states and officers and employees of the Armed Forces attended the first course at the university last October. Over 70 representatives of industry from 15 states and officers and employees of the Armed Forces attended the second course at the University in May.

The program consists of a series of conferences, lectures, and laboratory periods lasting from 8.30 a. m. to 5.00 p. m. each day except Sunday. General lectures will be given to the entire group. The trainees will be divided into small sections under the direct supervision of an instructor to facilitate the discussion of specific problems and the working of laboratory exercises.

The tuition for the course including books and supplies is $100. Trainees will be expected to provide for their own living expenses and transportation to and from Iowa City.

Rosán INSERTS AND STUDS

revolutionize fastening in SOFT METALS • PLASTICS • WOOD



Permanent because locked in the material.

May be molded in, or installed later for repair or replacement purposes.

Removable by drilling without disturbing the parent material.

The heart of the Rosán Locking System is the locking ring. Its serrations are broached into the parent material and prevent turning or loosening under vibration or torque.

Rosán Inserts and Studs are easily installed, can be easily removed. They do away with the need for oversize replacements, and so effect great savings in parts inventory, in addition to the savings in parts salvaged.

Leading aircraft companies have adopted the Rosan Locking System. The automotive industry and others are also recognizing the advantages of this revolutionary method of fastening.

Write or wire for full information.

National HEADED AND THREADED PRODUCTS

THE NATIONAL SCREW & MFG. CO., CLEVELAND 4, O.

Institute Yearbook Features Important Steel Developments

New York

• • • **The wartime need for using more pig iron in making open hearth steel to offset the reduced supply of scrap imposed new problems of raw materials selection, according to Clyde Denlinger of Bethlehem Steel Co. in a paper prepared for the 1945 Yearbook of American Iron & Steel Institute.**

Selection of the iron ores used in the open hearth furnace to counteract the additional amount of carbon present in pig iron, as compared with the amount of carbon present in the conventional scrap-pig mix, has presented several problems. One concerns the grade of the ore, such as soft (fine), hard (lump), briquetted and other grades. Another relates to the analysis. Some ores contain more moisture than others; some are relatively high in unwanted compounds such as silica.

A third type covers the preliminary treatment of some ores to get them into suitable condition for use in the furnace. A few ores can be mixed with blast furnace flue dust and then heated to yield a satisfactory porous sinter. Others can be mixed with roll scale, an iron oxide that forms at high temperature on rolled steel.

Despite fluctuations in the supplies of scrap and ore, Mr. Denlinger finds that steelmakers have been adept in varying procedures to utilize available steelmaking raw materials.

Pooling their wartime experience, consumers and producers of alloy steels have completed the first phase of a joint investigation of an improved method of specifying and testing various types of alloy steels, according to a paper, "Progress Report on Hardenability Bands," prepared for the institute's yearbook by John Mitchell, metallurgical engineer, Carnegie-Illinois Steel Corp.

The purpose of the investigation is to enable consumers to describe more completely what conditions of hardness they need in finished alloy steel products so that the steelmakers can supply exactly what is wanted to a greater precision than formerly. The study is being conducted by representatives of the Society of Automotive Engineers and the American Iron & Steel Institute Technical Committee on Alloy Steel.

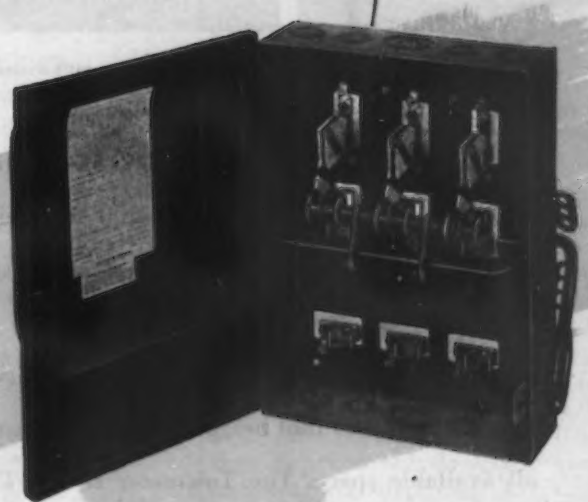
The joint study is developing a

WHY DO I PICK *Square D* SAFETY SWITCHES?

• Guess there are two or three reasons. Don't know offhand, how I'd rank 'em in importance, but they all add up. For one thing, Square D makes a pretty darn complete line of switches. During the past thirty years I've run into setups that called for about every type and size there is —and Square D hasn't let me down yet.

Another thing—Square D's got a crew of design engineers who know the score. Haven't met 'em, you understand, but you can judge 'em by what they put in their switches and not go wrong.

Then again, maybe I'm like a guy I know. Whenever he's in a strange town and doesn't know where to eat, he always looks for the place with the most folks. He figures that's a pretty good steer to good grub. Apply that kind of reasoning to safety switches and you can get only one answer. Maybe you've noticed—you run into that ◫ emblem *everywhere*.



SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

method of specifying how hard the steel should be, at the center of various sized rounds, after specimens of the steel are heated and quenched according to a detailed procedure. This method approximates actual conditions of use, for a large part of the alloy steel used is hardened or otherwise heat treated by the consumer.

This method, which includes chemical analysis, will be considered by consumers and producers as a tentative addition to existing specifications. The alloy steels investigated included some used before and during the war and others, such as some National Emergency Steels, which were developed during the war to conserve the supply of critical alloying elements.

Output of shells and bombs was greatly increased during the war as a result of the introduction of two processes which not only trebled production of shells and bombs in steel plants but also permitted important savings of manpower and steel, according to an article prepared for the institute by J. L. Johnson, chief research engineer of the Christy Park works of National Tube Co. The two processes are the Witter process for making shells, and the spinning process for bombs.

In making a 3-in. shell, for example, the Witter process starts with a heated steel slug shaped like a thick tube closed at one end. Three rolls "cross-roll" or knead the heated metal to reduce the wall thickness and lengthen the slug. The resulting "cup" is pushed through a sizing die to give it the desired dimensions before it is machined to the finished dimensions.

While the Witter process was developed on a small scale before the war, it was further developed during 1940 and 1941 to a mass production basis.

The spinning process for making 100-lb and 200-lb aerial bombs from steel tubes was used in the final processing of gas shells in 1918. Further development of the process from 1936 to 1939, on experimental orders for 100-lb bombs, provided the experience needed to adapt it for large scale use in World War II.

The process gets its name from the way it spins or forms the nose and tail sections of the bombs. One end of a seamless tube is placed in a furnace until it is hot enough for forging. The tube is then placed in a machine which spins it at a high rate of speed. A shaping wheel or tool, rotated by frictional contact with the spinning tube, forms the desired contours.

(CONTINUED ON PAGE 146)

OIL & STEEL

Steel pipe line mileages in U. S. total 389,000, divided into trunk lines as follows: crude oil, 128,000 miles; natural gas, 245,000 miles; gasoline, 16,000 miles. To this can be added an estimated equal mileage of gathering lines from the wells.

5 million bbls. daily of crude are produced, gathered, and transported in pipe lines.

Steel tank cars saved the day for the Allies at start of World War II by hauling eastward millions of bbls. of petroleum products while the "Big Inch" and "Little Inch" transcontinental pipe lines were being rushed to completion.

Pilot retired for "advanced years" by Army Air Corps, made first 100-octane tryout in 1934 as test pilot for airplane company. He filled the tanks of his Seversky with this new fuel and took off. Engine performance exceeded anything previously dreamed of. Pilot's name? Jimmie Doolittle!

First oil tank car, devised by Amos Densmore, 1865, a flat car on which he built two 45 bbl. wooden tanks, arrived in New York without leaking.

Col. Drake originated casing for world's first oil well to stop earth from caving in the hole before the drill got down to solid rock. By driving a length of iron pipe through the soil down 39 feet to bedrock, he drilled the well inside the pipe, thus establishing the flourishing business of manufacturing steel casing for oil and gas wells, in which the J&L pipe mills participate extensively.

William A. (Uncle Billy) Smith, and his two sons, experienced salt and water well drillers, were hired by Col. Drake to drill the first oil well on the site of an oil seepage long known around Titusville. The well came in Aug. 30, 1859 at 69½ feet. Uncle Billy leaped on a mule and set out to spread the news. That oil brought $20 a barrel.

Post-war motoring will benefit from products perfected by petroleum industry for war and enjoy cheaper, quicker, smoother driving, longer life for engine parts, G. H. Freyermuth, Standard Oil of New Jersey engineer, told *New York Times*.

Electric welded tube plant at Oil City, Pa., has been purchased by Jones & Laughlin Steel Corporation. Its production of electric welded mechanical and pressure tubing in sizes ⅜-inch to 4-inch outside diameter, inclusive, will supplement J&L's present line of seamless, lapwelded and butt-welded tubular products.

Steel has no substitute in the national economy, indicates the following extract from report submitted (June 14, 1945) by Senator J. C. O'Mahoney for Committee on Military Affairs: "In 1944, steel was the most important of all processed metallic and non-metallic basic materials used by manufacturing industries in the United States, accounting on a tonnage basis for about 85% of the total, while light metals accounted for only about 1.8%."

(CONTINUED FROM PAGE 142)

Communication systems that kept personnel and supplies on the move along Pacific battlefronts required tremendous amounts of fine steel wire, reports J. R. Thompson, manager of the metallurgical department, American Steel & Wire Co.

About 1,300,000 miles of one size of wire, almost as thin as a playing card, were required for a month's production of the Signal Corps' seven-wire strand used in communications. Assault wire, another communications requirement; wire woven into an armor around electrical cables in ships, and camouflage wire to disguise gun emplacements were a few of the many other types in war use.

Steel wire 0.013 in. in diameter is used for the communication strand. As four of these wires are twisted around three copper wires to make the strand, the wires must be tough enough to twist satisfactorily. Each individual wire must be able to support a load of 37 lb, equivalent to a strength of about 140 tons per sq in. of wire cross section.

Fine steel wire, which ranges in diameter from 1/16 in. down to 0.005 in., was also used in springs for time-fuse mechanisms, insect screening to safeguard mess halls, mine-trip wire which detonates the mine, fine mesh filter screens to block the passage of harmful substances into fuel and lubricating systems of aircraft engines, and wire to record sound.

OPA Has Authorized New Price Revisions

Washington

• • • **OPA has authorized** producers of stampings, screw machines and ferrous forgings to bill their customers on an adjustable pricing basis, pending a revision of maximum prices to meet reconversion needs. Increases over present ceilings that may be quoted, however, are limited to 8 pct.

In addition, all sales made on an adjustable pricing basis must be adjusted later to reflect actual new ceiling prices when the current review of ceilings is completed and the amount of price increases determined.

An upward adjustment in ceiling prices for stampings, screw machine products and ferrous forgings appears necessary, OPA said, because of increases in labor and material costs which cannot be absorbed in the narrow margin of profit which these industries had in effect on their civilian production.

McKAY

EVELERS

re specially designed for eveling the various widths nd thicknesses of all kinds of late.

Improved Heavy Type 2-Hi Plate Leveler

Individual Top Roll Adjustment, Stationary Lower Rolls. Accurate Dial Roll Settings.

Improved Medium Type 2-Hi Plate Levelers

Self contained portable unit, sturdy drive connected to rolls with heavy universal couplings. One shot lubrication.

ive us your requirements nd we will submit specifications for the size and type f Leveler you need.

ASSOCIATED COMPANY

e WEAN ENGINEERING CO., Inc. • WARREN, OHIO

The McKAY MACHINE Company

ENGINEERS AND MANUFACTURERS OF TUBE AND BAR DRAWBENCHES AND BAR SHEARS

YOUNGSTOWN, OHIO

Heating Likely to Be First Application Of Nuclear Energy, Says GE

Schenectady

• • • The most probable utilization of nuclear energy, the basis for the atomic bomb, is as a source of heat, according to heads of engineering and research for the General Electric Co., in answer to many questions received from industry and the general public alike, asking about the potentialities of atomic power.

Concerning the possible use of nuclear energy as a source of power to heat and light homes and buildings, operate factories, propel ships, locomotives, airplanes and automobiles, Harry A. Winne, G-E vice-president in charge of engineering policy, and Dr. C. Guy Suits, vice-president and director of the G-E Research Laboratory, predicted that several prospective uses of nuclear energy will become technically possible, but that it is too early to predict whether such uses will be economically practical.

In stating that the most probable utilization of nuclear energy is as a source of heat, the General Electric officials said that such heat in turn may produce steam or hot gases for use in conventional types of power generating equipment.

"Some people have asked concerning the possibility of direct conversion from nuclear energy to electric power in usable form. This seems to us an extremely remote possibility," said Mr. Winne and Dr. Suits. "There is a long road of development ahead. It is true that the success of the bomb demonstrated that we can release a tremendous amount of nuclear energy in one instantaneous blast, at a controlled time. But to make this form of energy commercially useful, we must learn how to generate it and control it in a way that is adaptable to power production. We have no doubt that we shall learn how to do this, but the learning will take a lot of research, development, and time."

Concerning the dangers to human life which result from the radiation accompanying nuclear energy, they said, "Obviously, if we should have to encase a nuclear power plant in many feet of lead or concrete, it would lose some of its attractiveness. Here also we believe we shall find a practical solution to the problem, but, again, this will take time."

Most difficult to answer is the question of the economic practicability of the commercial use of nuclear energy,

FOR ADAPTABILITY PUT IT ON THE BLANCHARD

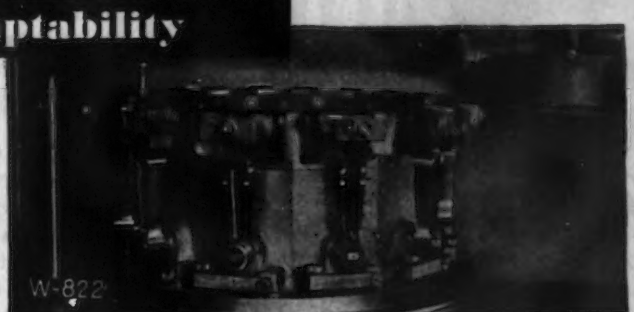
Adaptability

This picture clearly demonstrates the adaptability of the Blanchard. Here are a variety of pieces of cast iron, steel, and bronze ready to be ground on the No. 18 Blanchard Surface Grinder. Most of the pieces are to be ground on two sides, the usual limits being ±.0005" and the amount of stock removed from .015" to .020" per surface.

Adaptability

In adapting this work to the grinder, a Blanchard designed fixture holds ten pieces on the chuck at one time. These housing poles for magnetos have .140" stock to remove from steel laminations, and 30 pieces are finished per hour. This job also demonstrates Blanchard's ability to carry through from roughing to finishing operation.

Adaptability



This is an excellent example of increased production through adaptability. Formerly these master rods for an 1830 H.P. radial engine were milled and finish-ground one at a time at the rate of 15 to 20 minutes each. Now they are ground 10 at a time in a Blanchard special fixture on the No. 18 Blanchard Surface Grinder, which removes 3/8" of metal and turns them out finished at the rate of four minutes each.

Adaptability

The versatility of a Blanchard Grinder is well demonstrated in the adaptability of Blanchard No. 11 Surface Grinder. The illustration directly opposite shows a special fixture load of 48 glass prisms ready for grinding the hypotenuse. The "V" block fixture is held magnetically on the chuck. Grinding time is less than 3 minutes and stock removal .085".

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

the G-E officials explained. The $2,000,000,000 cost of the atomic bomb program unquestionably could be reduced greatly if a similar project were to be started today based on the knowledge already gained through this development.

To control power stations, railroads, or other businesses in which the generation or use of power is of extreme importance, the G-E engineering and research chiefs gave the following advice: "Were we responsible for conducting the affairs of such organizations, we should go right ahead with our plans for the years to come on the basis of present-day commercially available sources of energy; namely, coal, oil, and water power.

Commerce Dept. Lists Items Allowed to Be Shipped to France

Washington

• • • Imports into France from the United States through private commercial channels of merchandise restricted as to the number of articles and value, have been authorized by the French Provisional Government, according to the Dept. of Commerce.

It was pointed out by the Department that the list of commodities which can be imported under this authorization is very limited and their release to private trade is important chiefly because the action represents an initial departure from the policy of importing exclusively through French Government channels.

The categories of commodities for which the French Government will issue import licenses under established conditions were reported by Commerce to include the following:

1. Manufactured products (exclusive of industrial equipment, machine tools, agricultural machinery and trucks) weighing, for a complete shipment, less than five metric tons and valued at less than $20,000.

2. Spare parts of all kinds.

3. Raw materials and articles specifically intended to enter into the production of items to be exported.

France will continue for the time being to purchase the bulk of American merchandise required through its purchasing missions in this country.

Import transactions through private channels which have just been authorized must contribute to the overall French reconstruction program in order to receive the required French approval.

1ST QUARTER 1944

2ND QUARTER 1944

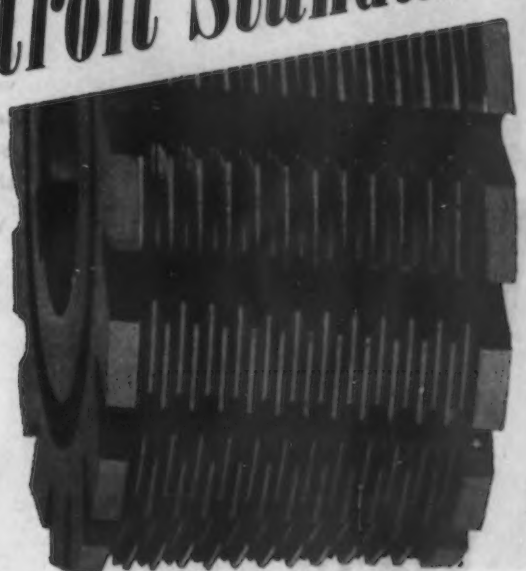
3RD QUARTER 1944

4TH QUARTER 1944

1ST QUARTER 1945

ORDERS FOR DETROIT STANDARD THREAD MILLING CUTTERS

They're Specifying Detroit Standards



Look at that quarter by quarter record of orders for DETROIT STANDARD thread milling cutters—yes, and DETROIT makes specials, too.

Those DETROIT standards—amplified by new types and sizes as needed—are becoming the accepted standards of Industry.

Many companies now simply order their thread milling cutters by DETROIT STANDARD Blank number and desired thread form. Eliminates Tool Engineering, saves delivery time.

Detroit Thread Milling Cutters, standard and special, are making unnecessary the slower more costly method of grinding on scores of precision threaded parts.

Ask for latest Bulletin giving standard sizes

• TAPPING MACHINES • TAP RECONDITIONERS •

DETROIT

TAP & TOOL CO.

8432 BUTLER AVE. DETROIT 11, U.S.A.

• TAPS—THREAD GAGES • CUTTER HOOK AND SPACING CHECKER •

Termination Claims Now Most Important Task of Contractors

New York

• • • Since VJ-Day the Navy has terminated nearly 50,000 war contracts involving more than $8,300,000,000, H. Struve Hensel, Assistant Secretary of the Navy said in a press conference Sept. 12.

The great bulk of cancellation work completed, with the second big contract problem arising out of the end of the war, the settlement of contractors' claims, is next on the agenda. The Navy estimates that there are 15,000 cases in which war contractors have claims for material purchased or work done. The remainder of contract cancellations will be without cost to the Navy, since contractors can divert the production into normal business channels.

"We are urging every Navy contractor to file his claims for terminated contracts now," Mr. Hensel said. "We want every possible claim filed before Oct. 15. If contractors will meet this deadline, the Navy will undertake to maintain the following timetable:

Oct. 15—Termination claims to be filed by contractors.

Nov. 15—Claims reviewed by Navy material inspectors and forwarded to contracting officers.

Dec. 15—Final settlements reached by contracting officers.

"Contracts which have been terminated since VJ-Day constitute 69 pct of all Navy contracts then outstand-

File Claims Promptly

New York

• • • Contractors are urged to file termination claims promptly. Delay in the presentation of claims may result in a long, drawn-out termination program since the military services expect to lose many of their key men by Jan. 1, 1946. Staffs are now considered adequate to handle termination claims but many, who now have sufficient points for discharge, may leave if work is not sufficiently heavy.

A possible result of this depletion of Army and Navy termination officers may likely be the transfer of terminations to the General Accounting Office.

Automatic Precision

. . . beyond human skill with push-button control

The Model 3-B JIGMIL

PROVIDES accuracy beyond human skill by push button control.

Automatic positioning between holes is controlled to within less than one ten-thousandth part of an inch.

Retraction and repositioning of the work for measuring or tool changing is by push button operation.

Any function is responsive to this centralized finger tip control.

The World's Finest BORING and Milling Machine

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

ing. Immediately upon the Jap surrender heavy cuts were made in contracts for ships, planes and armament, and those were announced on VJ-Day. Additional contract cancellations remain to be made as the future situation in the Pacific crystallizes, and as the demobilization of the Navy proceeds. Exactly how great these cuts will be cannot be predicted now, but certainly the biggest part of the job is finished," Mr. Hensel said.

Among contract cancellations which had not been previously announced are some items of consumers goods which are in heavy demand. Now that they are no longer needed for the war, they can be expected quickly to reach the civilian markets.

The following list gives major Navy contract terminations by bureaus:

Bureau of Ships	$1,428,726,000
Bureau of Ordnance	1,760,893,000
Bureau of Aeronautics	3,550,432,000
Bureau of Yards and Docks (Construction)	270,730,000
Bureau of Supplies and Accounts	691,165,000
Bureau of Medicine and Surgery	16,611,000
U. S. Marine Corps	240,527,000
Office of Aviation Supply	320,604,000

Included in the above are cancellations for the following civilian consumers' items which have not been previously announced:

Lumber and building materials	$26,000,000
Textiles (mostly cotton)	20,000,000
Auto tires and tubes	6,000,000
Canned fruits	16,000,000
Canned vegetables	20,000,000
Hand tools	5,000,000
Cleaning solvents, soap and soap powders	4,000,000
Shoes	2,000,000

Pullman Standard To Build Car Body Shop

Chicago

• • • **Using as a nucleus a large ship assembly building purchased from the Navy, Pullman Standard Car Mfg. Co. will construct a new passenger car body shop ranking as the largest in the world.**

The former Navy structure, located at Pullman's south side car works plant here, has an area of 171,000 sq ft and was bought for $927,472. In the conversion to make it suitable for car building it will be expanded to cover an area of 348,000 sq ft. In addition it will have a covered section of another 40,000 sq ft for steel storage. The new shop will take the place of the present steel shop originally designed and built for riveted passenger cars and later converted for the manufacture of welded lightweight cars. Under the new program Pullman hopes to build six lightweight passenger cars per day.

4-TON NUTCRACKER!

About the size of a baseball, the Brazilian Babassu nut is armored with a ¾" shell to protect its valuable oil-rich kernels. Time-honored method of whacking open the shells with machete was tedious, slow, and dangerous. Now production will be doubled, thanks to a "king size" portable nutcracker.

Applying a *4-ton* pressure necessary to crack the nuts open, the machine was designed by the A. P. Bamford Co., with the assistance of Frasse engineers — who recommended heat treated stainless steel working parts to provide necessary toughness, withstand tropic atmospheric corrosion — and remain fool proof to jungle workers' neglect.

Similar engineering counsel on *your* stainless requirements is an integral part of Frasse stainless service. Frasse *knows* stainless — and stocks it in a wide range of sizes, shapes and types for immediate use. Call on us. *Peter A. Frasse and Co., Inc., 17 Grand Street, New York 13, N. Y. (Walker 5-2200): 3911 Wissahickon Avenue, Philadelphia 29, Pa. (Radcliff 7100-Park 5541): 50 Exchange Street, Buffalo 3, N. Y. (Washington 2000): Jersey City, Hartford, Rochester, Syracuse, Baltimore.*

Idle, Excess Material Disposal Regulations In War Cancellations

Washington

• • • **Conditions under which materials made idle or excess by contract termination may be transferred to other contractors engaged in the same major program and received by them in excess of inventory limitations, have been outlined by WPB. The direction also covers those cases where production has been transferred by procurement agencies from one contractor to another.**

Under provisions of Direction 1 to Priorities Regulation 32, such materials may be transferred upon written authorization of the procuring agency and where quantities do not exceed actual contract requirements considering the material on hand plus quantities ordered which cannot be canceled.

The procurement agencies which may authorize transfers are War, Navy, Maritime Commission, War Shipping Administration, Army Air Forces and the Navy Bureau of Aeronautics.

Where production is transferred and suppliers of the original contractor have materials scheduled for that production, the continuing contractor may receive the materials for use in the same major program provided materials received are of a special nature, have no other manufacturing uses and would be scrapped if not used for production as originally intended and, in the case of standard materials and products, the quantities received are not in excess of four months' needs and the ultimate inventory will not exceed that required for six months' production. The same procedure must be followed, WPB pointed out, as in transfer of idle and excess materials.

The contractor is required upon receipt of materials under this direction promptly to cancel, reduce or postpone further deliveries from his suppliers, WPB explained, in order to reduce his inventory to the practicable minimum working level as soon as possible.

At the same time, conditions were announced by WPB under which a prime or subcontractor under a modified (not terminated) contract may accept continued deliveries of special items in excess of inventory limitations.

As set forth in Direction 3 to PR-

BECAUSE IT'S SULFITE-TREATED STEEL

THIS AXLE was heat-treated to make it as hard as rock. It has to be hard to resist wear —and strong to stand torque and strain. You see it carries a tractor!

But it must then be machined with great care and precision. Sounds difficult, doesn't it?

Yet it is simple to machine axles like this—when they're made from Sulfite-Treated Steel. That's because sulfite-treatment adds something to steel that keeps it from becoming "stubborn." Instead of being nearly impossible to machine when it gets very hard, Sulfite-Treated Steel is easily worked.

This steel is a metallurgical achievement. Through constant research our technicians developed this machinable metal and then carefully controlled its production. Here is another example of the uniform excellence of alloy and special steels made by Wisconsin Steel.

Sulfite-Treated Steel has solved a lot of machining problems and it will solve a great many more. New applications are constantly being found. And this is only the beginning.

Let Wisconsin's sales and metallurgical staffs introduce you to Sulfite-Treated Steel—the steel that licks machining problems.

WISCONSIN STEEL COMPANY
Affiliate of International Harvester Company
180 North Michigan Avenue Chicago 1, Illinois

WISCONSIN SULFITE-TREATED STEEL

32, a contractor may continue to accept deliveries where notified by his supplier that shipment cannot be resumed at a later date and such deliveries are rescheduled to bring the contractor's inventory into line within a period of six month. If the reduction cannot be accomplished within six months, deliveries may continue at the lowest practicable rate provided they are approved by the procuring agency.

No amounts of special items in excess of actual contract requirements may be received, it was explained. In addition, those received may be used solely in filling the specific contract or subcontract. If the contract is subsequently canceled, deliveries may be accepted only if already shipped by the supplier and the items which were specially intended for the contract cannot be readily used by the supplier to fill other orders.

G.M. Reveals Newly Designed Plane Engine

Detroit

• • • After about five years of closely guarded testing, a small aircraft engine of startlingly new design characteristics has been announced by General Motors Corp.

Formal announcement of the new powerplant is taken to mean that bugs have been ironed out after an extensive and lengthy period of flight testing at Detroit City Airport. Some quarters also are drawing the inference that the engine may be put into production for private aircraft—perhaps by the Buick Motor Division of G.M.

The new engine, rated at 200 hp, is a four-cylinder radial type operating on the two-cycle principle. It is unique in that a supercharging blower is used to increase performance and power reserve for takeoff and altitude, this being decidedly unusual on an engine of this size. Further, there are no valves, the blower function being performed by the pistons themselves.

The 200 hp output is developed with piston displacement of only 250 cu in., the size of an automobile engine, and dry weight is but 275 lb. It is only 35 in. in diam. Liquid cooling is employed.

Fuel consumption runs around 13 gal per hr, using 91 octane fuel, it was reported by the company.

The boosted 2-cycle principle of the engine is said to eliminate the added cost and weight of a variable pitch propeller. Design is simplified and number of parts reduced.

New High Ni-Mn Steel Control Cables Increase Plane Maneuverability

Cleveland

• • • America's airplanes of the future are going to have more flexible and efficient "muscles" as the result of a development recently perfected by technicians of the American Steel & Wire Co., subsidiary of U. S. Steel Corp. Thin steel cables made up of fine wires enable the pilot to manipulate the rudder and ailerons of his ship in much the same way that the muscles running down the human arm energize the hand and fingers.

The newly developed cable performs the same functions as former types and banishes a number of aircraft engineering difficulties in one sweeping stroke by having the ability to expand and contract in varying temperatures at almost the same rate as duralumin. The virtual elimination of this discrepancy between the two metals has done away with special compensating devices and at the same time has contributed to the efficiency of both the pilot and his plane.

Because they are concealed beneath the skin of the plane, control cables are often overlooked by the casual observer. However, their importance cannot be minimized.

For the most part, these cables have been made of plain carbon steel, although in some applications where extreme corrosion or temperature factors must be overcome, stainless has been used. Steel is the only material with sufficient tensile strength and ability satisfactorily to resist wear at points of contact with pulleys to perform this vital task. However, steel has a different coefficient of expansion than has duralumin, of which the frame of a plane is constructed. The result is that when a plane passes from temperatures at ground level to the subzero temperatures of high altitudes, the frame contracts to a greater degree than the ordinary control cables thus creating slackness in the cables and sluggish control of the ship. In passing from a temperature of 70°F to —70°F, for instance, in a running length of 70 ft the airframe of a plane will contract approximately ¾ in. more than the carbon steel control cable. Failure to compensate for the varying cable lengths assumes tremendous importance when it is considered that a B-17 Flying Fortress contains 3000 ft of control cables, while the new giant B-29 Superforts have considerably more, spreading to

all parts of the ship. This discrepancy had to be overcome by the use of temperature compensating devices in the control system which automatically took up the slack. However, these devices created added weight to the plane and their delicate and complicated construction demanded frequent servicing and attention, not always available in some areas.

The steel in the new control cables is a high nickel-manganese alloy formerly used for making hold-down devices for aluminum housings. Because of the special analysis of the material it required an entirely different practice in wire drawing technique to effect utilization of its maximum beneficial properties. Only after many months of work and experimentation was production of the material made possible through development of these drawing procedures, together with special closely controlled heat treatments.

All types of aircraft control cables are being produced from the new material in American Steel & Wire plants. They range from a single strand of seven wires where a degree of rigidity is desired, to seven strands of 19 wires each—a total of 133 fine wires—where a maximum of flexibility is demanded. Sizes range from 1/32 in to ¼ in diameters.

The net results are not only considerable weight savings resulting from the elimination of the compensating equipment, but more satisfactorily and efficient handling of the plane by the assurance of constant tension. The development has removed the necessity for extreme rigging tensions which in many cases increase the friction losses in the system to a point where actual control of the plane imposes pilot fatigue more rapidly than is justifiable.

To Hold Metal Symposium

Philadelphia

• • • A symposium on metallurgy will be sponsored jointly by Temple University and the Philadelphia Chapter of the American Society of Metals at the University on Friday, Sept. 28.

Quality control, phases of high chromium nickel alloys and the electron microscope's application to metallurgy will be discussed by a number of speakers during the day-long meeting. Dinner speakers include Dr. Charles H. Herty, national president of the ASM, and Dr. Robert L. Johnson, president of Temple University.

ICC Orders Reduction Of Freight Rates For Armor Plates and Shapes

Washington

• • • **Reduction in armor** plate railroad carload rates were ordered by the Interstate Commerce Commission last week. For armor plate and shape less than 3-in. in thickness, the railroads were told to establish rates on a par with those applying to commercial steel. For plates 3 in. and thicker, rates 115 pct of the commercial rates were established. Heavy reparations were also awarded. The rates established differ somewhat from those recommended in the examiner's report (THE IRON AGE, Feb. 22, page 110).

The cases were brought by the Navy and War Depts. They involved rates throughout the United States, except in southern classification territory and between that territory and official classification territory.

The extent of the reductions and reparations is indicated by the fact that the Chicago-Pacific Coast rate on light armor was slashed from $2.30 to $1.10 per 100 lb and on the basis of an average loading of 91,000 lb per car this will result in the carriers being required to repay approximately $1092 per car.

Among interveners in the cases were the Carnegie-Illinois Steel Corp.; and Great Lakes Steel Corp., which sought reparation; the Bethlehem Steel Co. and the Bethlehem-Hingham Shipyard, Inc., which made no claim for reparation; and the New York Shipbuilding Corp., which did not specifically ask for reparation.

Cutbacks Cause 11 Pct Drop in Employment

Washington

• • • **Due to cutbacks** the number of workers in the iron, steel and ordnance industries dropped 17 pct during August, largely after VJ-Day, the Bureau of Labor Statistics, Dept. of Labor announced on Sept. 10. Employment declined 12 pct in the electrical machinery, 9 pct in other machinery and 8 pct in non-ferrous metals. The overall reduction in manufacturing employment was 1,600,000 workers or 11 pct of the total, dropping from an estimated level of 13,900,000 to 12,300,000.

Seven-eighths of the cut occurred in the metal-chemical-rubber industries which produced the great bulk of

munitions output. The largest slash was in aircraft, with a 51 pct-decline in employment and it was followed by shipbuilding which saw a reduction of 20 pct.

This was the first actual measure of change in the total factory employment since the end of the war and was obtained by a telegraphic survey conducted by the Bureau with the special cooperation of representative firms in 19 manufacturing industries covering the period July 31 to Aug. 31.

Acting Commissioner of Labor Statistics, A. E. Hinrichs, pointed out that the figures represent net changes in employment and are not to be confused with figures of gross layoffs. The Bureau, he said, in its regular monthly reports on labor turnover will have accurate information, not only with reference to gross layoffs, but also figures on voluntary quits and re-hiring.

Small decreases in employments were noted in nearly all of the non-munitions industries. There were small increases, however, in tobacco and leather, and little change in lumber, food, paper, stone, glass and clay.

Occurrence of Lead In Lead-Bearing Steels

(CONTINUED FROM PAGE 83)

deg. to 464 deg. F., the steel structure being slightly distorted as a result of the exudation. An unsegregated billet showed lead exudation at a higher temperature of 572 deg. to 590 deg. F., the distribution of the lead being fairly dense and uniform. In the case of the ingot, the lead spurted out at the still higher temperature of 617 deg. to 626 deg. F., corresponding to the melting point of lead. The distribution of the lead on exuding showed a partial interdendritic formation. The size of the exuded lead particles was markedly less in the unsegregated than in the segregated specimens. In all cases, the bottom-end discards were selected for the examination of massive segregates, the remaining samples being free from such segregation.

In studying the pattern of lead segregation in two leaded ingots of 0.25 per cent carbon, 1 per cent manganese steel, sulphur prints and macro-etchings of the two half-ingots revealed the normal features of ingot segregation. Copper ammonium chloride etching revealed lead segregation just

within the base of the two ingot sections. Continuous lines parallel to the surface of the ingot base indicated interference in the crystal structure at the position of the lead segregation.

Lead prints showed the complete absence of massive lead segregation in the general body of the ingot section with the exception of areas about 1¼ to 1½ in. in width towards the outer surfaces of the base of the ingot sections. The distribution of lead as revealed by the standard positions and by variations in the three slices representing top, middle and bottom of the ingots was particularly uniform, the maximum variations being about 0.04 per cent lead. The highest values occurred in the chill and the lowest values one-third of the way up the central axis. The segregation of lead does not, it is concluded, follow completely the normal features of segregation in solid ingots.

An Adjustable-Range Force-Measuring Spring

(CONTINUED FROM PAGE 63)

the deflection of the weighing bar drops below a preset figure, electrical contacts again activate the motor control and re-establish the original force on the bar.

The spring with easily varied stiffness, shown in Fig. 3, is made similar to the one shown in Fig. 2, except that there are three slots instead of one. In the center of two slots transverse holes have been drilled. The lower slot is long and relatively close to the bottom of the beam. This is the most easily deflected portion of the bar. Should the force involved exceed the resistance of this section, short steel pins can be inserted in the center of the slot from each side to avoid interference with the extensometer probe. Thus the lower section is firmly coupled to the middle section and utilizes the stiffness of both. Should additional stiffness be required, pins inserted in the hole in the second slot causes the force to be opposed by three sections of the beam thus providing a maximum of stiffness.

With the new weighing bar it is possible to run tests on such widely dissimilar materials as steel, copper, porcelain and plastics and secure in each class the same degree of accuracy in measuring the stresses involved. By matching the stiffness of the beam to the forces required by the different tests, approximately the same degree of deflection is secured.

MACHINE TOOLS

. . . News and Market Activities

Machine Tool Reconversion Outlook More Optimistic

Cleveland

• • • During four transitional weeks of peace several significant trends, once relegated to the category of rumor, have emerged from the shadows and appeared on the temporal and enticing horizon of reconversion: Many machines ordered for war work were apparently specified with an eye toward reconversion; thus numerous cancellations have resulted in reinstatements; people are talking about re-tooling in terms of big money and plans entailing an outlay of $500,000 for this purpose are not a rarity; sales of government-owned machine tools to lessees in possession are climbing and consequent cancellations are becoming evident; and finally, as a result of the surplus and excess plant capacity, diversification has become increasingly apparent and important.

Generally speaking, the machine tool makers have an amazing amount of business, and despite some cancellations, a few of which are coming through from the Treasury Dept. on Russian orders, shipments are slated for an up-turn. But at the same time, many builders are frank in the prediction that demand is due for a noticeable drop when surplus machines come out in quantity; customers will look around, as many of them are doing now, to see if they can pick up something in the surplus.

Numerous manufacturers, surfeited with surplus machines, will implement their re-tooling plans from equipment that has been under their noses ever since it came off the original skids. In such cases, the lessee obviously knows the machine and its history and has been responsible for the sort of care it has received; now the opportunity to buy it at half price is here and lessees are taking advantage of it. Needless to say, the quality and condition of some of this equipment will keep many buyers off the market for the next 15 years.

Despite re-tooling talk, dealers are on the spot. The trend toward rebuilding leads predominantly toward the original manufacturer and cancellations resulting from sales to lessees in possession are coming in to them as well as the builders. With selling and rebuilding costs considerably higher than they were before the war, dealers are hoping that some arrangement can be worked out whereby they can sell surplus machines on lines which they have represented exclusively. And with some degree of justification, dealers believe they can sell tools at less cost to the government than the transactions currently passing through the hands of the RFC.

On the machine tool problem, RFC needs all the help it can get as it becomes increasingly obvious that there are two ways not to handle the surplus: One is to let it go all at once and the other is to play around with it too long. And in the back of many machine tool minds is the question of whether RFC will be able to do something to get surplus tools absorbed by industry and off the market before a good share of them are made obsolete by equipment builders are keeping up their sleeves.

Along this same line, it seems now that machine tool builders may have a fairly difficult time in keeping up with demands for constantly improving product. For the period to come there will be more plant capacity than the machine tool business in itself can support, nor can this capacity be utilized for machine tool manufacture alone. This situation is evidenced by announcements presaging the manufacture of such items as knitting machines, milk bottle machines and other dairy equipment. These are merely early examples of other products typifying those that will be made in the effort to fill additional plant capacity. Competent observers, substantiating this trend, say that the average machine tool builder is not going to be anything but successful in his venture into a varied range of durable goods.

Such diversification is not a new thing but in tune with the times it has become increasingly important. Many of the machine tool people have always had rather diversified lines and in the months and perhaps years to come this diversification may prove to be the lifeline of more than one machine tool shop. Oddly enough, those companies seemingly in the best position to weather a financial gale have been among the first to project their ability in new directions. The scope and quality of machine tool industry's operations during the war are adequate proof of the builders' ability to adapt themselves to new competitive enterprises.

On the local scene, reports of South American inquiries emanate from many quarters, with Brazil, Turkey, Portugal, India, Mexico, Italy and, of all places, Palestine, rounding out the promise of a broad export program. South American inquiries in the past have not amounted to much and informed sources are quick to evaluate the South American potential as largely a charitable undertaking. This, however, need not be the case in the future, simply because our government has supplied South Americans in the past.

•

Sales List Show Variety

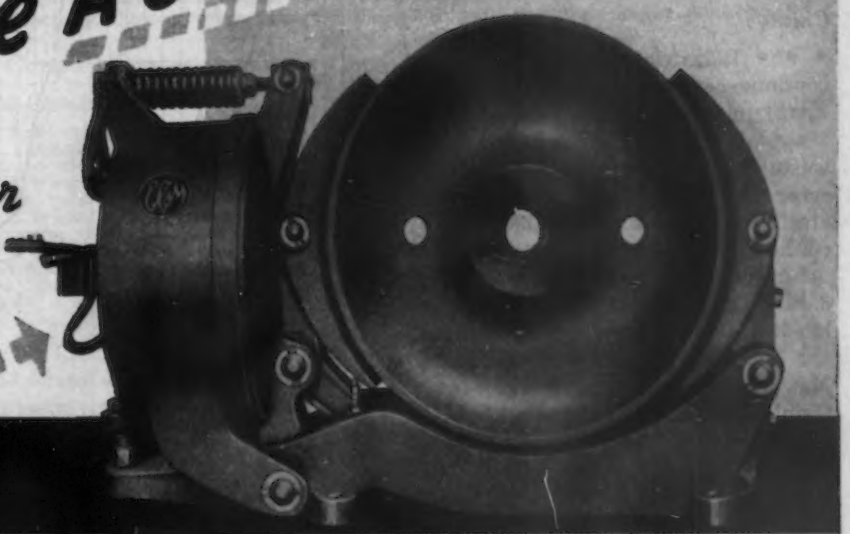
Chicago

• • • Special listing under general list 26 of machine tools at midwestern locations shows a wide variety of equipment offered for sale by Reconstruction Finance Corp., surplus property division, Chicago. Classifications include drill presses both large and small, drilling machines, fixed and portable grinders, bench and turret lathes, vertical and horizontal boring machines, gas and electric welding machinery and equipment, washers and driers, heat treat furnaces, marking machines, and honing machines. The equipment is at a number of scattered locations and does not represent the tooling of any single large plant. Used equipment which comprises most of the list, will be sold under the Clayton formula where applicable. The listing fills a 130-page volume.

TYPE WB BRAKE

Solves the A-C BRAKE Problem

. . . . gives better PERFORMANCE too...



Rectifier - Unit in compact form for separate mounting on existing installations.

MANY users of a.c. motor-driven cranes, hoists and machinery are switching to the EC&M Type WB Brake with rectifier-unit. Its *high-speed performance* and *reduced up-keep* for a.c. circuits have prompted its nationwide acceptance. Repeat orders indicate standardization on the WB Brake wherever a.c. brakes are needed.

These brakes not only eliminate the laminated members required in a.c. brake design, but give quick response. High initial current insures *fast release;* automatic reduction of the holding current results in *fast setting.*

The rectifier-unit is compact and is arranged for separate mounting for existing installations. On new projects, it may be combined with the motor control panel. Bulletin 1006 gives complete details on WB Brakes for a.c. operation. Bulletin 1004-D describes them for d.c. service.

THE ELECTRIC CONTROLLER AND MANUFACTURING CO.

2698 East 79th Street — Cleveland 4, Ohio

REDUCED UP-KEEP *and* BETTER OPERATION

because

No laminated magnets or plungers.
No destructive hammer-blow.
No a.c. chatter.
No coil burn-out due to shoe-wear affecting air-gap.
No motors, gears or pumps.
Has fast release and fast set.
Has ability to permit accurate inching.
Has hand release.
Has solid cast-steel magnet and armature.
Has short armature-movement.
Has thick, molded brake blocks 1/4" to 3/4" thick.

On Cranes, Hoists and Machinery
...the EC&M Type WB Brakes
give HIGH SPEED PERFORMANCE
—REDUCED UP-KEEP

NONFERROUS METALS

. . . News and Market Activities

Monthly Scrap Reports To WPB Discontinued

Chicago

• • • **Industrial concerns** may discontinue sending to War Production Board monthly reports on various kinds of salvage disposed of to the waste material industry, including scrap iron, aluminum, brass, copper, steel, waste paper and cardboard, according to WPB.

Reporting concerns should still send data on tin, antimony and lead scrap handled through the scrap trade to the Bureau of Mines, College Park, Md., as a check on these scarce materials.

•

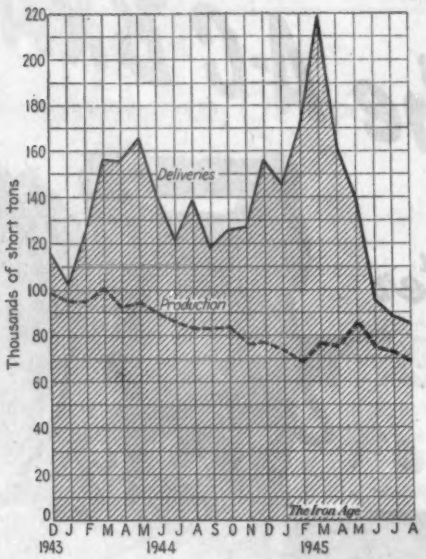
Lead Action Subject To Varying Judgments

New York

• • • **Demand for lead** is quiet and steady under the restrictions imposed by order M-38 which has not yet been revised as anticipated by the lead industry or by the Tin, Lead and Zinc Division, each of whom have divergent views as to the direction in which the order should be amended.

The industry points out that with a stockpile which is officially reported to be approaching 70,000 short tons at the end of the year, it desires to permit constructive use of the surplus in order to aid reconversion employment. Opportunities for constructive progress in this direction are said to lie in increased use of white lead, toys and ornamental castings, and other similar applications. An additional 2,000 tons of pig lead were allocated in September for production of white lead but due to the quarterly basis for deliveries of white lead paint established in paragraph F of the order, it was not possible to take advantage of the allotment. Members of the industry point to the recent cutbacks of ammunition production and tetra-ethyl lead as an indication that additional lead should be available for civilian application.

The War Production Board, on the other hand, view the lead supply-demand picture very critically, and are of the opinion that this country may expect to become a relatively lead-poor peacetime importing nation.



Refined Copper Production

Copper Production Decline

New York

• • • **Refined copper production** declined to 69,127 short tons in August due to labor shortages at the mines and refineries. This closely parallels the decline in copper deliveries due very largely to contract cutbacks. In August deliveries to customers dropped to 86,840 tons according to the Copper Institute.

These statistics indicate that during August copper was still being added to the stockpile and this may be expected to continue at least until November, at which time FEA's commitments for purchases abroad will expire. In view of the large government stockpile it is anticipated by some members of the industry that foreign purchases of copper may be expected to be dropped except were pressure to be brought by Chile or Mexico, and to be given consideration on the basis of maintaining friendly relations and a stable economy in certain Latin-American nations.

Producers are contracting for October deliveries and these are expected to require all domestic copper production. There is some indication of an urge to place orders well in advance in rare instances, perhaps with a prospect of a possible price rise.

Price of Indium Drops; Low Melting Alloy Use

New York

• • • **Producers have** dropped the price of indium to $2.25 per oz. and there is some indication that on large purchases the price might be shaded slightly. Indium has been dropping rapidly in price during the war as a result of greatly expanded production and consumption for aircraft engine bearings. Now, however, appreciable stocks are believed to be in the hands of producers and since the aircraft program has slowed there should be comparatively limited use of the metal.

One producer is making some low melting point alloys containing indium which melt at 117° F., 136° F. and 174° F., respectively.

•

Antimony Restricted Now

New York

• • • **Antimony continues** to be one of the few metals now subject to allocation. Although flame-proofing of fabrics and of paints no longer requires the large quantities of antimony oxide consumed during the war, the production of the smelter located in Laredo, Texas, is not adequate to supply full domestic requirements from Latin-American ores.

The normal prewar supply of antimony metal came from China in fully adequate quantities for our needs. However, WPB is uncertain as to whether antimony could be exported again from China, in view of the inflationary trends there, when our price ceiling is taken into consideration.

•

Zinc in Ample Supply

New York

• • • **Zinc continues** to be in tremendous oversupply according to the industry. It is reported there have been some shipments of slab zinc from the government stockpile prior to delivery of current industry stocks, and steps have been taken to avoid duplication of this occurrence. The zinc market is very quiet and purchasers are reluctant to place orders more than a few weeks beyond their needs.

Primary Metals

(Cents per lb., unless otherwise noted)

Aluminum, 99+%, del'd (Min. 10,000 lb.)	15.00
Aluminum pig	14.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars per lb. contained Be	$17.00
Cadmium, del'd	90.00
Cobalt, 97-99% (per lb.)	$1.50 to $1.57
Copper, electro, Conn. valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.8%, dollars per troy oz.	$2.25
Iridium, dollars per troy oz.	$100.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9 + %, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb. flask, f.o.b. New York	$102-$104
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.35
Zinc, New York	8.65

Remelted Metals

(Cents per lb. unless otherwise noted)

Aluminum, No. 12 Fdy. (No. 2)	9.00 to 10.00
Aluminum, deoxidizing No. 2, 3, 4	$6.00 to 9.50
Brass Ingot 85-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
80-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.37	....	20.37
Copper, H.R.	....	17.37	....
Copper drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	26.50	26.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 14S, 67½c. (T).

Plate: 0.250 in. and heavier: 2S and 3S, 21.2c.; 52s, 24.2c.; 61S, 22.3c.; 24S, 24.3c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths. ¼ in., 34c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 99 lb., 56c.; less than 25 lb., 66c.

NONFERROUS SCRAP METAL QUOTATIONS

†(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.00
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25
Automobile radiators	7.00
Zincy bronze borings	8.00
Zincy bronze solids	8.00

OPA Group 3†

Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]

OPA Group 4†

Refinery brass	4.75*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys

Briquetted Cartridge Brass Turnings	8.62½
Cartridge Brass Turnings, Loose	7.87½
Loose Yellow Brass Trimmings	7.87½

Aluminum*

Plant scrap, segregated	
2S solids	8.00
Dural alloys, solids 14, 17, 18, 24S, 25S	4.50
turnings, dry basis	3.00
Low copper alloys 51, 52, 61, 33S solids	7.50
turnings, dry basis	5.75
Plant scrap, mixed	
Solids	4.00
Turnings, dry basis	2.75
Obsolete scrap	
Pure cable	8.00
Old sheet and utensils	6.00
Old castings and forgings	5.00
Pistons, free of struts	5.00
Pistons, with struts	3.00
Old alloy sheet	5.00

Magnesium*

Segregated plant scrap	
Pure solids and all other solids, exempt	
Borings and turnings	1.50
Mixed, contaminated plant scrap	
Grade 1 solids	3.00
Grade 1 borings and turnings	2.00
Grade 2 solids	2.00
Grade 2 borings and turnings	1.00

*Nominal.

Zinc

New zinc clippings, trimmings	6.50
Engravers, lithographers plates	6.50
Old zinc scrap	4.75
Unsweated zinc dross	5.00
Die cast slab	4.50
New die cast scrap	4.45
Radiator grilles, old and new	3.50
Old die cast scrap	3.00

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead including cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 36c. per lb.; 90 to 98% Ni, 26c. per lb contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point in 500 lb lots)

Copper, frt. allowed	
Cast, oval, 15 in. or longer	35½
Electrodeposited	18⅞
Rolled, oval, straight	19½
Curved	20⅝
Brass, 80-20, frt. allowed	
Cast, oval, 15 in. or longer	23½
Zinc, cast, 99.99, 15 in. or longer	16¼
Nickel, 99 per cent plus, frt. allowed	
Cast	47
Rolled, depolarized	48
Silver, 999 fine	
Rolled, 1-9 troy oz., per oz.	58*

Chemicals

(Cents per lb., f.o.b. shipping point)

Copper cyanide, 1-5 bbls.	34.00
Copper sulphate, 99.5. crystals, bbls.	7.75
Nickel salts, single, 425 lb. bbls., frt. allowed	13.50
Silver cyanide, 100 oz. lots	—.417*
Sodium cyanide, 96 per cent, domestic, 100 lb. drums	15.00
Zinc cyanide, 100 lb. drums	33.00
Zinc sulphate, 99 per cent, crystals, bbls., frt. allowed	6.25

*Price based on use of foreign silver.

SCRAP

. . . News and Market Activities

Strategic Stockpiling Begun at Ravenna

New York

• • • Following the recent broadening of the strategic metals and alloys stockpiling program, Army Ordnance is now stockpiling certain types of alloy steel scrap, including all identifiable grades of stainless, at the Ravenna Ordnance Center, Apco, Ohio.

This change, constituting part of what is probably the first concrete evidence of a national stockpiling program, specifically includes alloy steels with a total content of 1.75 pct minimum in nickel, chrome or molybdenum, and which can be identified by AISI or SAE numbers. Single alloy steels with a minimum content of approximately 1 pct may also be considered for acceptance in this program.

Ordnance officers have been instructed to take title to all quantities presented for disposition as termination inventory, of minimum CAGG (and above) of the copper-base alloys and alloy steels conforming to the stockpiling specifications and types, and which cannot be disposed of by retention or sale at the maximum applicable OPA ceiling price as scrap prior to the time for removal to effect plan clearance.

Copper base alloys include cartridge brass, gilding metal, and leaded, commercial free turning brass. Stockpile specifications for alloy steel require that it shall be in either unprocessed mill or foundry forms; or obsolete, dismantled or rejected parts, or components, semi-finished or finished; excess parts or components; artillery gun tubes and breech blocks; or armor plate.

Ordnance districts, shipping copper-base alloys into Ravenna, include two copies of the chemical analysis of each heat or lot, and lots are kept segregated to aid identification. This applies specifically to cartridge brass. Gilding metal and leaded free turning brass are sent to the Ordnance center in box cars in such a manner that it will be suitable for remelting, but without any attempt to segregate heats or lots. Alloy steel scrap is shipped in open gondolas, and is also accompanied by a statement that it conforms to the specified chemical analysis and is not contaminated. Carload lots only of cartridge brass, gilding metal, or leaded commercial free turning brass are sent, and the two are never mixed.

It has been pointed out that the stockpiling program offers an opportunity to hold off the market any strategic scrap metal for which a ceiling bid cannot be secured. However, after more than six weeks of operation, the Ravenna Ordnance center is reportedly in possession of only 300 tons of scrap metal, including 20 carloads of virgin copper. Informed sources, who take into account the possibility of more scrap becoming available, say that it is impossible to build a big stockpile on the basis of the present directives.

Other alloy steels included by the latest change are as follows:

Alloy Steel Grades Included in Change

NUMBER	NICKEL	CHROME	MOLYBDENUM
2300 Series	3.25 to 3.75		
2500 Series	4.75 to 5.25		
3100 Series	1.10 to 1.40	0.55 to 0.90	
3200 Series	1.65 to 2.00	0.99 to 1.20	
3300 Series	3.25 to 3.75	1.40 to 1.75	
4100 Series		0.41 to 1.10	0.20 to 0.40
4300 Series	1.65 to 2.00	0.40 to 0.90	0.20 to 0.30
4600 Series	1.40 to 2.00		0.15 to 0.30
4800 Series	3.25 to 3.75		0.20 to 0.30
Stainless Steel	All identifiable grades		

PITTSBURGH—The scrap market has turned strong here, in common with the situation at Valley points. Solid demand is being manifested from many scrap consumers, resulting in pickup of all available scrap. Should demand increase above present levels a definitely tight market will exist. Supply of most grades continues somewhat on the thin side, and this is obviously a factor in the situation and is resulting in somewhat lowered volume of shipments than would otherwise be the case.

CHICAGO—The Chicago market entered the holiday period with a basic firmness in prime openhearth grades, but with blast furnace grades showing some fluctuation. Supply appeared to be the governing factor in the openhearth picture, with mills snapping up tonnage as it appeared. The machine shop turnings market, suffering from disappearance of supply sources, continues to be dominated by balers' purchases.

DETROIT — Prices on all grades bounced suddenly back to ceiling this week as the result of extremely low factory production of scrap coupled with a wave of buying by many of the principal mid-western mills. The long turnings shipments to some Valley points were reported going at ceiling plus springboard. The long turnings situation was aided by orders for baled turnings. Simultaneously, electric furnace steel, not much wanted in past weeks, is more in demand.

BUFFALO — The scrap market was quiet but firm this week at top prices. Steady decline in the volume of material coming out since the end of the war has become more pronounced. This condition coupled with continued scarcity of yard workers has more than offset cautiousness of some consumers. Another 5000-ton cargo of steelmaking scrap arrived from the Lakehead by boat and additional supplies were received by canal.

NEW YORK—Turnings prices have increased to ceilings here this week with continued and aggravated shortages of all grades of scrap. Consumers are actively seeking available supplies, and production of scrap has declined together with military cutbacks. Yards have not benefited as yet in any way by any releases to labor due to cancellations.

CLEVELAND—Prices are firm here at ceilings with little change in transactions from last week. Holiday shutdowns at scrap offices have some effect on the lack of business.

BOSTON — Any weakness in turnings and borings prices noted a week back was quickly dissipated with the coming into the market of an eastern Pennsylvania mill. No actual sales at price concessions are reported. The entire list of materials is firm at ceilings. Buying of good No. 1 steel is reported, but there is no snap to things. Foundries are still hungry for No. 1 machinery and cupola cast. Boston Navy Yard offers 500 tons of unprepared steel and 500 tons of light iron.

CINCINNATI—While there has been no change in prices, current movement being at ceiling, trading is small and a feeling of uncertainty pervades the market for the most part. Most users of scrap are out of the market for the time being and no one seems to be interested in tonnage purchases. By and large the trade is marking time to see the trend.

IRON AND STEEL SCRAP PRICES

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages. Where asterisks are used on quotations below, this indicates a ceiling price to which must be added brokerage fee and adjusted freight.

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
RR. hvy. melting	21.00*
No. 2 hvy. melting	20.00*
RR. scrap rails	21.50*
Rails 3 ft. and under	23.50*
No. 1 comp'd sheets	20.00*
Hand bdld. new shts.	20.00*
Hvy. axle turn.	19.50*
Hvy. steel forge turn.	19.50*
Mach. shop turn.	$14.50 to 15.00
Short shov. turn.	17.00*
Mixed bor. and turn.	15.00*
Cast iron borings	16.00*
Hvy. break cast.	**16.50***
No. 1 cupola	20.00*
RR. knuck. and coup.	24.50*
RR. coil springs	24.50*
Rail leaf springs	24.50*
Rolled steel wheels	24.50*
Low phos. bil. crops	25.00*
Low phos.	22.50*
RR. malleable	22.00*

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 1 bundles	18.75*
No. 2 dealers' bndls.	18.75*
Bundled mach. shop turn.	18.75*
Galv. bundles	16.75*
Mach. shop turn.	13.75*
Short shovel. turn.	15.75*
Cast iron borings	$12.50 to 13.00
Mix. borings & turn.	12.50 to 13.00
Low phos. hvy. forge	23.75*
Low phos. plates	21.25*
No. 1 RR. hvy. melt.	19.75*
Reroll rails	22.25*
Miscellaneous rails	20.25*
Rails 3 ft. and under	22.25*
Locomotive tires, cut	22.75 to 23.25
Cut bolsters & side frames	20.25 to 21.25
Angles & splice bars	22.25*
Standard stl. car axles	**25.00 to 25.50**
No. 3 steel wheels	23.25*
Couplers & knuckles	23.25*
Agricul. malleable	22.00*
RR. malleable	22.00*
No. 1 mach. cast	20.00*
No. 1 agricul. cast	20.00*
Hvy. breakable cast	16.50*
RR. grate bars	15.25*
Cast iron brake shoes	15.25*
Stove plate	19.00*
Clean auto cast	20.00*
Cast iron carwheels	20.00*

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
No. 1 bundles	19.50*
No. 2 bundles	19.50*
Mach. shop turn.	$10.50 to 11.00
Shoveling turn.	12.50 to 13.00
Cast iron borings	11.50 to 12.00
Mixed bor. & turn.	**11.50 to 13.00**
Low phos. plate	22.00*
No. 1 cupola cast	20.00*
Hvy. breakable cast.	16.50*
Stove plate	19.00*
Scrap rails	21.00*

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	$15.05*
No. 2 hvy. melting	15.05*
No. 1 and 2 bundles	15.05*
Busheling	15.05*
Turnings, shovelings	12.05*
Machine shop turn.	10.05*
Mixed bor. & turn.	10.05*
Cl'n cast, chem. bor.	13.06 to 14.15*
Truck delivery to foundry	
Machinery cast	21.00 to 23.51*
Breakable cast	21.57 to 21.87*
Stove plate	20.00 to 23.51*

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting	$17.32*
No. 2 hvy. melting	17.32*
No. 1 bundles	17.32*
New busheling	17.32*
Flashings	17.32*
Mach. shop turn.	12.32*
Short shov. turn.	14.32*
Cast iron borings	13.32*
Mixed bor. & turn.	12.32*
Low phos. plate	19.82*
No. 1 cupola cast	20.00*
Charging box cast.	19.00*
Hvy. breakable cast.	16.50*
Stove plate	19.00*
Automotive cast	20.00*

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 2 bundles	18.75*
Mach. shop turn.	13.75*
Shoveling turn.	15.75*
Cast iron borings	13.50 to 14.00
Mixed bor. & turn.	13.75*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Cast, charging box	19.00*
Hvy. axle forge turn.	**18.25***
Low phos. plate	21.25*
Low phos. punchings	21.25*
Billet crops	21.25*
RR. steel wheels	23.25*
RR. coil springs	23.25*
RR. malleable	22.00*

ST. LOUIS

Per gross ton delivered to consumer:

Heavy melting	$17.50*
Bundled sheets	17.50*
Mach. shop turn.	$9.00 to 9.50
Locomotive tires, uncut	18.00
Misc. std. sec. rails	19.00*
Rerolling rails	21.00*
Steel angle bars	21.00*
Rails 3 ft. and under	21.50*
RR. springs	22.00*
Steel car axles	21.50
Stove plate	19.00*
Grate bars	15.25*
Brake shoes	15.25*
RR. malleable	22.00*
Cast iron carwheels	20.00*
No. 1 mach'ery cast	20.00*
Breakable cast	16.50*

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$17.00*
No. 2 hvy. melting	17.00*
No. 2 bundles	17.00*
No. 1 busheling	17.00*
Long turnings	$9.50 to 10.00
Cast iron borings	11.00 to 11.50
Bar crops and plate	17.50 to 18.00
Structural and plate	17.50 to 18.00
No. 1 cast	20.00*
Stove plate	17.00
Steel axles	18.00*
Scrap rails	18.50
Rerolling rails	20.50*
Angles & splice bars	18.50 to 19.00
Rails 3 ft. & under	21.00*
Cast iron carwheels	16.50 to 17.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
No. 2 hvy. melting	20.00*
Low phos. plate	22.50*
No. 1 busheling	20.00*
Hydraulic bundles	20.00*
Mach. shop. turn.	15.00*
Short shovel. turn.	17.00*
Cast iron borings	16.00*

NEW YORK

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$15.33*
No. 2 hvy. melting	15.33*
Comp. black bundles	15.33*
Comp. galv. bundles	13.33*
Mach. shop turn.	10.33*
Mixed bor. & turn.	10.33*
Shoveling turn.	12.33*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Charging box cast	19.00*
Stove plate	19.00*
Clean auto cast	20.00*
Unstrip. motor blks.	17.50*
Cl'n chem. cast bor.	14.33*

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.25*
No. 1 bundles	19.25*
No. 2 bundles	19.25*
No. 2 hvy. melting	19.25*
Mach. shop turn.	14.25*
Shoveling turn.	16.25*
Cast iron borings	15.25*
Mixed bor. & turn.	14.25*
No. 1 cupola cast	20.00*
Stove plate	19.00*
Low phos. plate	21.75*
Scrap rails	20.75*
Rails 3 ft. & under	23.75*
RR. steel wheels	23.75*
Cast iron car wheels	20.00*
RR. coil & leaf spgs.	23.75*
RR. knuckles & coup.	23.75*
RR. malleable	22.00*
No. 1 busheling	19.25*

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
Compressed sheet stl.	19.50*
Drop forge flashings	19.00*
No. 2 bundles	19.50*
Mach. shop turn.	14.50*
Short shovel.	16.50*
No. 1 busheling	19.50*
Steel axle turn.	19.00*
Low phos. billet and bloom crops	24.50*
Cast iron borings	15.50*
Mixed bor. & turn.	14.50*
No. 2 busheling	17.00*
No. 1 machine cast	20.00*
Railroad cast	20.00*
Railroad grate bars	15.25*
Stove plate	19.00*
RR. hvy. melting	20.50*
Rails 3 ft. & under	23.00*
Rails 18 in. & under	24.25*
Rails for rerolling	23.00*
Railroad malleable	22.00*
Elec. furnace punch	22.00*

SAN FRANCISCO

Per gross ton delivered to consumer:

RR. hvy. melting	$16.00
No. 1 hvy. melting	16.00
No. 2 hvy. melting	15.00
No. 2 bales	$13.50 to 14.25
No. 3 bales	9.50 to 10.50
Mach. shop turn.	7.00
Elec. furn. 1 ft., und.	15.50 to 17.00
No. 1 cupola cast	19.00 to 21.00

LOS ANGELES

Per gross ton delivered to consumer:

No. 1 hvy. melting	$14.50 to $15.50
No. 2 hvy. melting	13.50 to 14.50
No. 2 bales	12.50 to 13.50
No. 3 bales	9.00 to 10.00
Mach. shop turn.	4.50
No. 1 cupola cast	19.00 to 21.00

SEATTLE

Per gross ton delivered to consumer:

RR. hvy. melting	$13.50
No. 1 hvy. melting	13.50
No. 3 bundles	11.50
Elec. furn. 1 ft., und.	17.00
No. 1 cupola cast	20.00*

Comparison of Prices . .

Advances over past week in **Heavy Type**; declines in *Italics*. Prices are f.o.b. major basing points. The various basing points for finished and semifinished steel are listed in the detailed price tables.

Flat-Rolled Steel: (cents per pound)	Sept. 18, 1945	Sept. 11, 1945	Aug. 14, 1945	Sept. 19, 1944
Hot-rolled sheets	2.20	2.20	2.20	2.10
Cold-rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.70	3.70	3.70	3.50
Hot-rolled strip	2.10	2.10	2.10	2.10
Cold-rolled strip	2.80	2.80	2.80	2.80
Plates	2.25	2.25	2.25	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terneplate: (dollars per base box)				
Tinplate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tinplate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (cents per pound)				
Merchant bars	2.25	2.25	2.25	2.15
Cold-finished bars	2.75	2.75	2.75	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (cents per pound)				
Bright wire	2.75	2.75	2.75	2.60
Wire nails	2.90	2.90	2.90	2.55
Rails: (dollars per gross ton)				
Heavy rails	$43.00	$43.00	$43.00	$40.00
Light rails	45.00	45.00	45.00	40.00
Semifinished Steel: (dollars per gross ton)				
Rerolling billets	$36.00	$36.00	$36.00	$34.00
Sheet bars	36.00	36.00	36.00	34.00
Slabs, rerolling	36.00	36.00	36.00	34.00
Forging billets	42.00	42.00	42.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (cents per pound)				
Wire rods	2.15	2.15	2.15	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (per gross ton)	Sept. 18, 1945	Sept. 11, 1945	Aug. 14, 1945	Sept. 19, 1944
No. 2 foundry, Phila.	$26.84	$26.84	$26.84	$25.84
No. 2, Valley furnace	25.00	25.00	25.00	24.00
No. 2, Southern, Cin'ti	25.44	25.44	25.44	24.44
No. 2, Birmingham	21.38	21.38	21.38	20.38
No. 2 foundry, Chicago†	25.00	25.00	25.00	24.00
Basic, del'd eastern Pa.	26.34	26.34	26.34	25.34
Basic, Valley furnace	24.50	24.50	24.50	23.50
Malleable, Chicago†	25.00	25.00	25.00	24.00
Malleable, Valley	25.00	25.00	25.00	24.00
L. S. charcoal, Chicago	42.34	42.34	42.34	37.34
Ferromanganese‡	135.00	135.00	135.00	135.00

† The switching charge for delivery to foundries in the Chicago district is 60¢ per ton.
‡ For carlots at seaboard.

Scrap: (per gross ton)				
Heavy melt'g steel, P'gh	$20.00	$20.00	$20.00	$17.75
Heavy melt'g steel, Phila.	18.75	18.75	18.75	16.38
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.32	17.32	17.32	12.75
Low phos. plate, Youngs'n	22.50	22.50	22.50	17.75
No. 1 cast, Pittsburgh	20.00	20.00	20.00	22.50
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Chicago	20.00	20.00	20.00	22.17
Coke, Connellsville: (per net ton at oven)				
Furnace coke, prompt	$7.50	$7.50	$7.50	$7.00
Foundry coke, prompt	9.00	9.00	9.00	8.25
Nonferrous Metals: (cents per pound to large buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin, Straits, New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, virgin, del'd	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

Composite Prices . .

Starting with the issue of Apr. 22, 1943, the weighted finished steel index was revised for the years 1941, 1942 and 1943. See explanation of the change on p. 90 of the Apr. 22, 1943 issue. Index revised to a quarterly basis as of Nov. 16, 1944; for details see p. 98 of that issue. The finished steel composite prices for the current quarter are an estimate based on finished steel shipments for the previous quarter. These figures will be revised when the actual data of shipments for this quarter are compiled.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
Sept. 18, 1945	2.41571¢ per lb	$24.61 per gross ton	$19.17 per gross ton
One week ago	2.41571¢ per lb	$24.61 per gross ton	$19.17 per gross ton
One month ago	2.41571¢ per lb	$24.61 per gross ton	$19.17 per gross ton
One year ago	2.30837¢ per lb	$23.61 per gross ton	$17.63 per gross ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1945	2.41571¢ May 29	2.21189¢ Jan. 2	$24.61 Feb. 20	$23.61 Jan. 2	$19.17	$19.17
1944	2.30837¢ Sept. 5	2.21189¢ Oct. 5	$23.61	$23.61	19.17	$15.67 Oct. 24
1943	2.25513¢	2.25513¢	23.61	23.61	19.17	$19.17
1942	2.26190¢	2.26190¢	23.61	23.61	19.17	$19.17
1941	2.43078¢	2.43078¢	$23.61 Mar. 20	$23.45 Jan. 2	$22.00 Jan. 7	$19.17 Apr. 10
1940	2.30467¢ Jan. 2	2.24107¢ Apr. 16	23.45 Dec. 23	22.61 Jan. 2	21.83 Dec. 30	16.04 Apr. 9
1939	2.35367¢ Jan. 3	2.26689¢ May 16	22.61 Sept. 19	20.61 Sept. 12	22.50 Oct. 3	14.08 May 16
1938	2.58414¢ Jan. 4	2.27207¢ Oct. 18	23.25 June 21	19.61 July 6	15.00 Nov. 22	11.00 June 7
1937	2.58414¢ Mar. 9	2.32263¢ Jan. 4	23.25 Mar. 9	20.25 Feb. 16	21.92 Mar. 30	12.67 June 8
1936	2.32263¢ Dec. 28	2.05200¢ Mar. 10	19.74 Nov. 24	18.73 Aug. 11	17.75 Dec. 21	12.67 June 9
1935	2.07642¢ Oct. 1	2.06492¢ Jan. 8	18.84 Nov. 5	17.83 May 14	13.42 Dec. 10	10.33 Apr. 29
1934	2.15367¢ Apr. 24	1.95757¢ Jan. 2	17.90 May 1	16.90 Jan. 27	13.00 Mar. 13	9.50 Sept. 25
1933	1.95578¢ Oct. 3	1.75836¢ May 2	16.90 Dec. 5	13.56 Jan. 3	12.25 Aug. 8	6.75 Jan. 3
1932	1.89196¢ July 5	1.83901¢ Mar. 1	14.81 Jan. 5	13.56 Dec. 6	8.50 Jan. 12	6.43 July 5
1931	1.99626¢ Jan. 13	1.86586¢ Dec. 29	15.90 Jan. 6	14.79 Dec. 15	11.33 Jan. 6	8.50 Dec. 29
1930	2.25488¢ Jan. 7	1.97319¢ Dec. 9	18.21 Jan. 7	15.90 Dec. 16	15.00 Feb. 18	11.25 Dec. 9
1929	2.31773¢ May 28	2.26498¢ Oct. 29	18.71 May 14	18.21 Dec. 17	17.58 Jan. 29	14.08 Dec. 3

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 pct of the United States output. Index recapitulated in Aug. 28, 1941 issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

. . . Prices of Finished Iron and Steel

Steel prices shown here are f.o.b. basing points, in cents per pound unless otherwise indicated. Extras apply. Delivered prices do not reflect 3 pct tax on freight. (1) Mill run sheet, 10¢ per 100 lb under base; primes, 25¢ above base. (2) Unassorted commercial coating. (3) Widths up to 12-in. inclusive. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25¢ per 100 lb to fabricators. (8) Also shafting. For quantities of 20,000 to 39,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (11) Boxed. (12) This base price for annealed, bright finish wires, commercial spring wire. (13) Produced to dimensional tolerances in AISI Manual Sect. 6. For price exceptions to finished and semi-finished steels turn several pages.

Basing Points	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown Ohio	Gulf Ports, Cars	Pacific Ports, Cars [10]	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot-rolled	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.20¢	2.30¢	2.20¢		2.75¢	2.30¢	2.44¢	2.37¢
Cold-rolled [1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 gage)	3.70¢	3.70¢	3.70¢		3.70¢	3.70¢	3.70¢	3.70¢	3.80¢	3.70¢		4.25¢		3.94¢	3.87¢
Enameling (20 gage)	3.45¢	3.45¢	3.45¢	3.45¢			3.45¢		3.55¢	3.45¢		4.10¢	3.55¢	3.81¢	3.77¢
Long ternes [3]	3.80¢	3.80¢	3.80¢									4.55¢		4.16¢	4.12¢
STRIP															
Hot-rolled [3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold-rolled [4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester=3.00¢)					2.90¢	3.15¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity cold-rolled	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester=3.35¢)					3.05¢	3.31¢	
TINPLATE															
Standard cokes, base box	$5.00	$5.00	$5.00						$5.10					5.36¢	5.32¢
Electro, box { 0.25 lb	$4.35	$4.35	$4.35												
0.50 lb	$4.50	$4.50	$4.50						$4.60						
0.75 lb	$4.65		$4.65						$4.75						
BLACKPLATE															
29 gage [5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢ [11]			3.37¢
TERNES, MFG.															
Special coated, base box	$4.30	$4.30	$4.30						$4.40						
BARS															
Carbon steel	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢		(Duluth=2.35¢)			2.60¢	2.90¢	2.35¢	2.59¢	2.57¢
Rail steel [6]	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢					2.60¢	2.90¢			
Reinforcing (billet) [7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢	2.25¢	2.39¢	
Reinforcing (rail) [7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	2.55¢	2.25¢		2.47¢
Cold-finished [8]	2.75¢	2.75¢	2.75¢	2.75¢		2.75¢		(Detroit=2.80¢)			(Toledo=2.90¢)			3.09¢	3.07¢
Alloy, hot-rolled	2.70¢	2.70¢				2.70¢		(Bethlehem, Massillon, Canton=2.70¢)					2.90¢		
Alloy, cold-drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.45¢		
PLATES								(Coatesville and Claymont=2.25¢)							
Carbon steel [12]	2.25¢	2.25¢	2.25¢	2.25¢	2.25¢		2.25¢	2.25¢			2.60¢	2.80¢	2.47¢	2.44¢	2.30¢
Floor plates	3.50¢	3.50¢									3.85¢	4.15¢		3.86¢	3.93¢
Alloy	3.50¢	3.50¢			(Coatesville=3.50¢)						3.85¢	4.15¢		3.70¢	3.59¢
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem=2.10¢)			2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R															
0.26 to 0.50 carbon	2.80¢			2.80¢			(Worcester=3.00¢)								
0.51 to 0.75 carbon	4.30¢			4.30¢			(Worcester=4.50¢)								
0.76 to 1.00 carbon	6.15¢			6.15¢			(Worcester=6.35¢)								
1.01 to 1.25 carbon	8.35¢			8.35¢			(Worcester=8.55¢)								
WIRE [9]															
Bright [12]	2.75¢	2.75¢		2.75¢	2.75¢	¢	(Worcester=2.85¢)		(Duluth=2.80¢)			3.25¢			3.07¢
Galvanized	Add proper size extra and galvanizing extra to Bright Wire base														
Spring (high carbon)	3.35¢	3.35¢		3.35¢			(Worcester=3.45¢)					3.85¢			3.67¢
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.72¢

SEMIFINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3.00 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12.00 higher. Provo, $11.20 higher. Delivered prices do not reflect 3 pct tax on freight rates.

Per Gross Ton

Rerolling $36.00
Forging 42.00

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo or Bethlehem, per gross ton $54.00

Price delivered Detroit $2.00 higher; East Michigan, $3.00 higher.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

Per Gross Ton

Openhearth or bessemer $36.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.15c.
Worcester, Mass.	2.25c.
Birmingham	2.15c.
San Francisco	2.65c.
Galveston	2.40c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.00 higher; East Michigan, $3 higher.

Price Exceptions: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$43.00
Angle splice bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$45.00
Light rails (from rail steel)	44.00
	Base per Lb.
Cut spikes	3.25c.
Screw spikes	5.40c.
Tie plate, steel	2.30c.
Tie plates, Pacific Coast	2.45c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham: cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

TOOL STEEL

*(F.o.b. Pittsburgh, Bethlehem, Syracuse. *Also Canton, O.)*

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium*	43c.
Oil hardening*	24c.
Special carbon*	22c.
Extra carbon*	18c.
Regular carbon*	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	*Pacific Coast Basing Points†*
	Base per Keg	
Standard wire nails	$2.90	$3.40
Coated nails	2.90	3.40
Cut nails, carloads	3.85	....
	Base per 100 Lb.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*	67	85
Fence posts, carloads	69	86
Single loop bale ties	66	91
Galvanized barbed wire**	72	82
Twisted barbless wire	72	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 9442-45 Ann.	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-48 Ann.
**Philadelphia	$3.518	$4.872[5]	$4.768[a]	$3.922	$4.772	$3.605	$3.668	$3.822	$4.172	$5.818	$6.868	$7.072	$8.172
New York	3.59	4.613[5]	5.110	3.974[6]	4.772	3.768	3.758	3.853	4.203	5.858	6.908	7.103	8.203
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.244	6.012	7.062	7.194	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.152	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.265	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3.85	5.80	6.65	6.65	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.987	5.837	6.887	6.887	7.987
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.85	5.808	6.858	6.65	7.75
Buffalo	3.35	4.40	4.75[4]	3.819	4.669	3.53	3.40	3.35	3.85	5.60	6.65	6.65	7.75
Detroit	3.45	4.50	5.00[4]	3.70	4.859[17]	3.609	3.661	3.45	3.90	5.93	6.98	6.959	8.059
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.661	3.691	3.611	4.111	5.95	7.00	7.011	8.261
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.131	5.981	7.031	7.031	8.131
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.85	5.60	6.65	6.65	7.90
St. Paul	3.50	4.46	5.257[4]	3.86	5.102[17]	3.813	3.813	3.763	3.461	5.94	6.99	7.361	8.461
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.543	....	....	....	....
Indianapolis	3.518	4.568	4.918	3.768	4.741	3.63	3.63	3.58	4.08	5.93	6.98	6.98	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.53	....	....	....	....
Memphis	3.965[7]	4.66	5.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058[e]	5.079	5.358	4.308	....	4.158	4.158[e]	4.108[e]	4.729	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.473[3]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.20[3]	6.10[4]	4.95	5.613[15]	4.95	4.65	4.40	5.663	8.204	9.404	9.304	10.454
San Francisco	4.55[14]	7.30[4]	6.35[4]	4.50[14]	7.333[17]	4.65[14]	4.35[14]	4.15[14]	5.433	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.05[4]	5.95[4]	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.883	....	9.404	....	....
Portland	4.65[11]	6.60[4]	5.75[4]	4.75[11]	....	4.85[11]	4.45[11]	4.45[11]	5.633	8.304	9.404	8.304	9.404
Salt Lake City	4.530[17]	....	6.17[13]	5.53[17]	....	4.99[17]	4.99[17]	4.89[17]	6.00	....	....	....	....

National Emergency Steels

MILL EXTRAS

Designation	Basic Open-Hearth		Electric Furnace		Designation	Basic Open-Hearth		Electric Furnace	
	Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs		Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs
NE 8612	0.65¢	$13.00	$1.15	$23.00	NE 9427	0.75¢	$15.00	$1.25	$25.00
NE 8615	0.65	13.00	1.15	23.00	NE 9430	0.75	15.00	1.25	25.00
NE 8617	0.65	13.00	1.15	23.00	NE 9432	0.75	15.00	1.25	25.00
NE 8620	0.65	13.00	1.15	23.00	NE 9435	0.75	15.00	1.25	25.00
NE 8622	0.65	13.00	1.15	23.00	NE 9437	0.75	15.00	1.25	25.00
NE 8625	0.65	13.00	1.15	23.00	NE 9440	0.75	15.00	1.25	25.00
NE 8627	0.65	13.00	1.15	23.00	NE 9442	0.80	16.00	1.30	26.00
NE 8630	0.65	13.00	1.15	23.00	NE 9445	0.80	16.00	1.30	26.00
NE 8632	0.65	13.00	1.15	23.00	NE 9447	0.80	16.00	1.30	26.00
NE 8635	0.65	13.00	1.15	23.00	NE 9450	0.80	16.00	1.30	26.00
NE 8637	0.65	13.00	1.15	23.00					
NE 8640	0.65	13.00	1.15	23.00					
NE 8642	0.65	13.00	1.15	23.00	NE 9722	0.65	13.00	1.15	23.00
NE 8645	0.65	13.00	1.15	23.00	NE 9727	0.65	13.00	1.15	23.00
NE 8647	0.65	13.00	1.15	23.00	NE 9732	0.65	13.00	1.15	23.00
NE 8650	0.65	13.00	1.15	23.00	NE 9737	0.65	13.00	1.15	23.00
					NE 9742	0.65	13.00	1.15	23.00
					NE 9745	0.65	13.00	1.15	23.00
NE 8712	0.70	14.00	1.20	24.00	NE 9747	0.65	13.00	1.15	23.00
NE 8715	0.70	14.00	1.20	24.00	NE 9750	0.65	13.00	1.15	23.00
NE 8717	0.70	14.00	1.20	24.00	NE 9763	0.65	13.00	1.15	23.00
NE 8720	0.70	14.00	1.20	24.00	NE 9768	0.65	13.00	1.15	23.00
NE 8722	0.70	14.00	1.20	24.00					
NE 8725	0.70	14.00	1.20	24.00					
NE 8727	0.70	14.00	1.20	24.00	NE 9830	1.30	26.00	1.80	36.00
NE 8730	0.70	14.00	1.20	24.00	NE 9832	1.30	26.00	1.80	36.00
NE 8732	0.70	14.00	1.20	24.00	NE 9836	1.30	26.00	1.80	36.00
NE 8735	0.70	14.00	1.20	24.00	NE 9837	1.30	26.00	1.80	36.00
NE 8737	0.70	14.00	1.20	24.00	NE 9840	1.30	26.00	1.80	36.00
NE 8740	0.70	14.00	1.20	24.00	NE 9842	1.30	26.00	1.80	36.00
NE 8742	0.70	14.00	1.20	24.00	NE 9845	1.30	26.00	1.80	36.00
NE 8745	0.70	14.00	1.20	24.00	NE 9847	1.30	26.00	1.80	36.00
NE 8747	0.70	14.00	1.20	24.00	NE 9850	1.30	26.00	1.80	36.00
NE 8750	0.70	14.00	1.20	24.00					
					NE 9912	1.20	24.00	1.55	31.00
NE 9415	0.75	15.00	1.25	25.00	NE 9915	1.20	24.00	1.55	31.00
NE 9417	0.75	15.00	1.25	25.00	NE 9917	1.20	24.00	1.55	31.00
NE 9420	0.75	15.00	1.25	25.00	NE 9920	1.20	24.00	1.55	31.00
NE 9422	0.75	15.00	1.25	25.00	NE 9922	1.20	24.00	1.55	31.00
NE 9425	0.75	15.00	1.25	25.00	NE 9925	1.20	24.00	1.65	31.00

Note 1: The ranges shown are restricted to sizes 100 sq. in. or less or equivalent cross-sectional area 18 in. wide or under with a maximum individual piece weight of 7000 lb. irrespective of size. **Note 2:** For steels ordered to such ranges, below the size and weight restriction, the average of all the chemical checks must be within the limits specified subject to check analysis variations given in Table 4, Section 10, AISI Steel Products Manual. **Note 3:** When acid open-hearth is specified and acceptable, add to basic open-hearth alloy differential 0.25c. per lb. for bars and bar strip and $5 per gross ton for billets, blooms and slabs. **Note 4:** The extras shown are in addition to the base price of $2.70 for 100 lb. on finished products and $54 per gross ton on semi-finished steel, major basing points, and are in cents per pound when applicable to bars and bar-strip and in dollars per gross ton when applicable to billets, blooms and slabs. The full extra applicable over the base price is the total of all extras indicated by the specific requirements of the order. The higher extra shall be charged for any size falling between two published extras.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base.

NE ALLOY BARS: 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 199 lb. (7) 400 to 1499 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 800 to 4999 lb. (12) 800 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(a) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports*[a])

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

[a]Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

WELDED PIPE AND TUBING

Base discounts, f.o.b. Pittsburgh district and Lorain, Ohio, mills

(F.o.b. Pittsburgh only on wrought pipe) base price—$200.00 per net ton

	Black	Galv.
Steel (buttweld)		
½-in.	63½	51
¾-in.	66½	55
1-in. to 3-in.	68½	57½
Wrought Iron (buttweld)		
½-in.	24	3½
¾-in.	30	10
1-in. and 1¼-in.	34	16
1½-in.	38	18½
2-in.	37½	18
Steel (lapweld)		
2-in.	61	49½
2½-in. and 3-in.	64	52½
3½-in. to 6-in.	66	54½
Wrought Iron (lapweld)		
2-in.	30½	12
2½-in. to 3½-in.	31½	14½
4-in.	33½	18
4½-in. to 8-in.	32½	17
Steel (butt, extra strong, plain ends)		
½-in.	61½	50½
¾-in.	65½	54½
1-in. to 3-in.	67	57
Wrought Iron (same as above)		
½-in.	25	6
¾-in.	31	12
1-in. to 2-in.	38	19½
Steel (lap, extra strong, plain ends)		
2-in.	59	48½
2½-in. and 3-in.	63	52½
3½-in. to 6-in.	66½	56
Wrought Iron (same as above)		
2-in.	33½	15½
2½-in. to 4-in.	39	22½
4½-in. to 6-in.	37½	21

On buttweld and lapweld steel pipe jobbers are granted a discount of 5 pct. On l.c.l. shipments prices are determined by adding 25 pct and 30 pct and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lapweld and one point lower discount, or $2 a ton higher on all buttweld.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect 3 pct tax on freight rates.

BOILER TUBES

Seamless steel and lapweld commercial boiler tubes and locomotive tubes, Minimum wall. Net base prices per 100 ft f.o.b. Pittsburgh, in carload lots.

	Seamless Cold-Drawn	Seamless Hot-Rolled	Lapweld, Hot-Rolled
2 in. O.D. 13 B.W.G.	15.03	13.04	12.38
2½ in. O.D. 12 B.W.G.	20.21	17.54	16.58
3 in. O.D. 12 B.W.G.	22.48	19.50	18.35
3½ in. O.D. 11 B.W.G.	28.37	24.62	23.15
4 in. O.D. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb or ft and over	Base
30,000 lb or ft to 39,999 lb or ft	5 pct
20,000 lb or ft to 29,999 lb or ft	10 pct
10,000 lb or ft to 19,999 lb or ft	20 pct
5,000 lb or ft to 9,999 lb or ft	30 pct
2,000 lb or ft or 4,999 lb or ft	45 pct
Under 2,000 lb or ft	65 pct

Corrosion and Heat Resisting Steel

(Base price, cents per pound, at points indicated: P—Pittsburgh; Ch—Chicago; Cl—Cleveland; C—Canton; M—Middletown, O.; Sy—Syracuse; D—Dunkirk; W—Watervliet; N—Newark, N. J.; B—Baltimore; R—Reading; Y—Youngstown)

Chromium-Nickel Alloys

	No. 304	No. 302
Ingot, P,Ch,C,B,R,y	Subject to	negotiation
Blooms, P,Ch,C,R,y	21.25	20.40
Slabs, P,Ch,C,B,R,y	21.25	20.40
Billets, P,Ch,C,N,W,Sy,B	Subject to	negotiation
Billets, forging, P,Ch,C,D,B,R,y	21.25	20.40
Bars, h-r,P,Ch,C,D,W,N,Sy,B,R	25.00	24.00
Bars, c-f,P,Ch,Cl,C,M,D,N,Sy,B,R	25.00	24.00
Plates, P,M	29.00	27.00
Shapes, structural, P,Ch	25.00	24.00
Sheets, P,Ch,M,C	36.00	34.00
Strip, h-r,P,Ch,R,C,y	23.50	21.50
Strip, c-r,P,Cl,N,R,C,y	30.00	28.00
Wire, c-d, Cl,D,Sy,B,R,C	25.00	24.00
Wire, flat, c-r,Cl,B	30.00	28.00
Rod, h-r,N,Sy	25.00	24.00
Tubing, seamless, P,Ch,C (4 in. to 6 in.)	66.63	66.63

Straight Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
Ingot, P,Ch,C,B,R,y	Subject to		negotiation	
Blooms, P,Ch,C,R,y	15.725	16.15	19.125	23.375
Slabs, P,Ch,C,B,R,y	15.725	16.15	19.125	23.375
Billets, P,Ch,C,N,W, Sy,B	Subject to		negotiation	
Billets, forging, P,Ch, C,D,B,R,y	15.725	16.15	19.125	23.375
Bars, h-r,P,Ch,C,D,W, N,Sy,B,R	18.50	19.00	22.50	27.50
Bars, c-f,P,Ch,Cl,C,M, D,N,Sy,B,R,	18.50	19.00	22.50	27.50
Plates, P,M	21.50	22.00	26.50	30.50
Shapes, structural, P,Cl	18.50	19.00	22.50	27.50
Sheets, P,Ch,M,C	26.50	29.00	32.50	36.50
Strip, h-r,P,Ch,R,y,C	14.00	17.50	24.00	35.00
Strip, c-r, P,Cl,N,R,y,C.	22.00	22.50	32.00	52.00
Wire, c-d,Cl,D,Sy,B,R,C	18.50	19.00	22.50	27.50
Wire, flat, c-r,Cl,B	22.00	22.50	32.00	52.00
Rod, h-r,N,Sy	18.50	19.00	22.50	27.50
Tubing, seamless, P,Ch,C (4 in. to 6 in.		63.30		

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00*
Sheets	19.00

*Includes annealing and pickling

EXCEPTIONS TO RPS 6

Ingots, carbon, rerolling—Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast ports; Empire Sheet & Tinplate Co., $34.25; Pgh. Steel Co., $33.10. Granite City Steel, $39.45.

Ingots, carbon, forging—Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports; Pgh. Steel Co., $38.10.

Ingots, alloy—C/1 delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Slabs, per gross ton—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel $47.50; Kaiser Co., (rerolling) $58.64, (forging) $64.64, f.o.b. Los Angeles.

Blooms, per gross ton—Phoenix Iron Co. (rerolling) $41; (forging) $47; Pgh. Steel Co. (rerolling) $38.25, (forging) $44.25; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger $37.75 f.o.b. Portsmouth; Kaiser Co. (rerolling) $58.64, (forging) $64.64 (shell steel) $74.64 f.o.b. Los Angeles.

Sheet Bar, per gross ton—Empire Sheet & Tinplate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging, per gross ton—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto, Ohio; Phoenix Iron Co. $47 mill; Geneva Steel Co. $64.64 f.o.b. Pacific Coast; Pittsburgh Steel Co. $49.50; Kaiser Co. $64.64, (shell steel) $74.64, f.o.b. Los Angeles.

PRICES

Billets, Rerolling, per gross ton—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. 4 in. sq. or larger $37.75, smaller $39.50 f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at $39 base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continental Steel Corp. (1¾ x 1¾) $39.50, (2 x 2) $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.60 Birmingham; Ford Motor Co. $34 Dearborn, Mich.; Geneva Steel Co. $58.64 f.o.b. Pacific Coast; Pgh. Steel Co. $43.50; Kaiser Co. $58.64 f.o.b. Los Angeles.

Structural Shapes—Phoenix Iron Co. 2.35c. basing pts. (export) 2.50c. Phoenixville; Knoxville Iron Co. 2.30c. basing points; Kaiser Co. 3.20c. f.o.b. Los Angeles.

Rails, per gross ton—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron, $46 Pueblo.

Hot Rolled Plate—Granite City Steel Co. 2.85c. produced on DPC eqpt., 2.35c. otherwise; Knoxville Iron Co. 2.25c. basing pts.; Kaiser Co. and Geneva Steel Co. 3.20c. Pacific Ports; Central Iron and Steel Co. 2.50c. basing points; Granite City Steel Co. 2.35c. Granite City.

Merchant Bars—W. Ames Co., 10 tons and over, 2.85c. mill; Eckels-Nye Steel Corp. 2.50c. basing pts. (rail steel) 2.40c.; Phoenix Iron Co. 2.40c. basing pts.; Sweet Steel Co. (rail steel) 2.33c. mill; Joslyn Mfg. & Supply Co., 2.35c. Chicago; Calumet Steel Div., Borg Warner Corp. (8 in. mill bar), 2.35c. Chicago; Knoxville Iron Co., 2.30c. basing pts.; Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.ob Madison, Ill.; Milton Mfg. Co., 2.75c. f.o.b. Milton, Pa.

Pipe Skelp—Wheeling Steel, Benwood, 2.05c.

Reinforcing Bars—W. Ames & Co., 10 tons and over, 2.85c. mill; Sweet Steel Co. (rail steel), 2.33c. mill; Columbia Steel Co., 2.50c. Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Mansfield, Mass., f.o.b. Mansfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants, f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass., f.o.b. Readville; Medart Co. in certain areas, Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co., for delivery except Texas and Okla., Chicago base, f.o.b. Fort Worth, Tex.; Connors Steel Co., shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co., 2.30c. Chicago; Knoxville Iron Co., 2.25c. basing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel, 2.25c. Parkersburg. Granite City Steel 2.45c.

Galvanized Sheets—Andrews Steel Co. 3.75c. basing pts.; Parkersburg Iron & Steel Co., 3.85c. Parkersburg; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is 2.45c. per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

Wire Products—Pittsburgh Steel Co., f.o.b. Pittsburgh, per 100 lb., rods, No. 5 to 9/32 in., 2.20c.; rods, heavier than 9/32, 2.35c.; bright wire, 2.725c.; bright nails, 2.90c.; lead and furnace annealed wire, 2.85c.; pot annealed wire, 2.85c.; galvanized barbed wire, 3.90c.; plain staples, 2.55c.; galvanized staples, 2.65c.; bright spring wire, 3.30c.; galvanized spring wire, 3.45c.

BASING POINT* BASE PRICES

Basing Point	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Bethlehem	$25.50	$26.00	$26.50	$27.00	.....
Birdsboro	25.50	26.00	26.50	27.00	$30.50
Birmingham	20.00	21.38	.....	26.00	.....
Buffalo	24.00	25.00	25.50	26.00	30.50
Chicago	24.50	25.00	25.00	25.50	.....
Cleveland	24.50	25.00	25.00	25.50	.....
Detroit	24.50	25.00	25.00	25.50	.....
Duluth	25.00	25.50	25.50	26.00	.....
Erie	24.50	25.00	25.50	26.00	.....
Everett	25.50	26.00	26.50	27.00	.....
Granite City	24.50	25.00	25.00	25.50	.....
Hamilton	24.50	25.00	25.00	.....	.....
Neville Island	24.50	25.00	25.00	25.50	.....
Provo	22.50	23.00	.....	.....	.....
Sharpsville[1]	24.50	25.00	25.00	25.50	.....
Sparrows Point	25.50	26.00	.....	.....	.....
Steelton	25.50	.....	.....	.....	30.50
Swedeland	25.50	26.00	26.50	27.00	.....
Toledo	24.50	25.00	25.00	25.50	.....
Youngstown	24.50	25.00	25.00	25.50	.....

DELIVERED PRICES† (BASE GRADES)

Consuming Point	Basing Point	Freight Rate	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Boston	Everett	$ .50	$26.00	$26.50	$27.00	$27.50	.....
Boston	Birdsboro-Steelton	4.02	.....	.....	.....	.....	$34.52
Brooklyn	Bethlehem	2.50	28.00	28.50	29.00	29.50	.....
Brooklyn	Birdsboro	2.92	.....	.....	.....	.....	33.42
Canton	Cleveland	1.39	25.89	26.39	26.39	26.89	.....
Canton	Buffalo	3.19	.....	.....	.....	.....	33.69
Cincinnati	Birmingham	4.06	24.06	25.44	.....	.....	.....
Cincinnati	Hamilton	1.11	.....	.....	26.11	.....	.....
Cincinnati	Buffalo	4.40	.....	.....	.....	.....	34.90
Jersey City	Bethlehem	1.53	27.03	27.53	28.03	28.53	.....
Jersey City	Birdsboro	1.94	.....	.....	.....	.....	32.44
Los Angeles	Provo	4.95	27.45	27.95	.....	.....	.....
Los Angeles	Buffalo	15.41	.....	.....	.....	.....	45.91
Mansfield	Cleveland & Toledo	1.94	26.44	26.94	26.94	27.44	.....
Mansfield	Buffalo	3.36	.....	.....	.....	.....	33.86
Philadelphia	Swedeland	.84	26.34	26.84	27.34	27.84	.....
Philadelphia	Birdsboro	1.24	.....	.....	.....	.....	31.74
San Francisco	Provo	4.95	27.45	27.95	.....	.....	.....
San Francisco	Buffalo	15.41	.....	.....	.....	.....	45.91
Seattle	Provo	4.95	27.45	27.95	.....	.....	.....
Seattle	Buffalo	15.41	.....	.....	.....	.....	45.91
St. Louis	Granite City	.50	25.00	25.50	25.50	26.00	.....
St. Louis	Buffalo	7.07	.....	.....	.....	.....	37.87

* Maximum per gross ton, established by OPA February 14, 1945. † Prices do not reflect 3 per cent tax on freight.

(1) Struthers Iron & Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

Charcoal pig iron base prices for Lyles, Tenn., and Lake Superior furnaces, $33.00 and $34.00, respectively. Newberry Brand of Lake Superior charcoal iron $39.00 per g.t., f.o.b. furnace, by order L 39 to RPS 10, April 11, 1945, retroactive to March 7, 1945. Delivered to Chicago, $42.34. High phosphorus iron sells at Lyles, Tenn., at $28.50.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

Silvery iron and bessemer ferrosilicon up to and including 14.00 per cent silicon covered by RPS 10 as amended Feb. 14, 1945. Silvery iron, silicon 6.00 to 6.50 per cent, C/L per G.T., f.o.b. Jackon, Ohio—$30.50; f.o.b. Buffalo—$31.75. Add $1.00 per ton for each additional 0.50% Si. Add 50c. per ton for each 0.50% Mn over 1.00%. Add $1.00 per ton for 0.75% or more P. Bessemer ferrosilicon prices are $1.00 per ton above silvery iron prices of comparable analysis.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, ¢ per lb, ton lots.

Copper, electrolytic, 150 and 200 mesh	21½¢ to 23½¢
Copper, reduced, 150 and 200 mesh	20½¢ to 25½¢
Iron, commercial, 100 and 200 mesh 96 + % Fe	12½¢ to 15¢
Iron, crushed, 200 mesh and finer, 90 + % Fe carload lots	4¢
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots	63¢
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33¢
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42¢
Iron carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90¢
Aluminum, 100 and 200 mesh	*25¢
Antimony, 100 mesh	30¢
Cadmium, 100 mesh	$1.40
Chromium, 100 mesh and finer	$1.25
Lead, 100, 200 & 300 mesh	11½ to 15¢
Manganese	65¢
Nickel, 150 mesh	51½¢
Solder powder, 100 mesh	3½¢ plus metal
Tin, 100 mesh	58¾¢
Tungsten metal powder, 98%-99%, any quantity, per lb	$2.60
Molybdenum powder, 99%, in 200-lb kegs, f.o.b. York, Pa., per lb.	$3.60
Under 100 lb	$3.00

*Freight allowed east of Mississippi.

COKE

	Net Ton
Furnace, beehive (f.o.b. oven)	
Connellsville, Pa.	$7.50*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	9.00
Foundry, By-Product	
Chicago, del'd	13.75
Chicago, f.o.b.	13.00
New England, del'd	14.65
Kearny, N. J., f.o.b.	13.05
Philadelphia, del'd	13.23
Buffalo, del'd	13.40
Portsmouth, Ohio, f.o.b.	11.50
Painesville, Ohio, f.o.b.	12.15
Erie, del'd	13.15
Cleveland, del'd	13.20
Cincinnati, del'd	13.25
St. Louis, del'd	14.25
Birmingham, del'd	10.90

* Hand drawn ovens using trucked coal permitted to charge $8.60 per ton plus transportation charges.

PRICES

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

Base discount less case lots

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed

(Hexagon or Square)

⅞ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1⅜ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 in. through 1 in.	59	..
1⅛ in. through 1⅜ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 per cent additional discount.

Stove Bolts	*Consumer*
Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws	*Consumer Per Cent Off List*
Upset full fin, hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.30c.
Armature	3.65c.
Electrical	4.15c.
Motor	5.05c.
Dynamo	5.75c.
Transformer 72	6.25c.
Transformer 65	7.25c.
Transformer 58	7.75c.
Transformer 52	8.55c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

PRICES

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Carload lots (packed)	141.00
Less ton lots (packed)	148.50

$1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	32c.
L.c.l. lots	34c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carloads, f.o.b. shipping point with freight allowed.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.25c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si.	8.90c.	9.05c.	9.55c.
90-95% Si.	11.05c.	11.20c.	11.65c.

Spot sales add: 45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

Silvery Iron, Silicon 14.01 to 14.50 per cent, $45.50 per G. T. f.o.b. Jackson, Ohio. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add $1.00 per ton for low impurities, not to exceed: P—0.05%, S—0.04%, C—1.00%. Covered by MPR 405.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

(65-72% Cr. 2% max. Si)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10%	13.00c.	13.40c.	14.00c.
62-66% Cr, 5-7% C	13.50c.	13.90c.	14.50c.

FERROALLOY PRICES

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 2c. per lb. to regular low-carbon ferrochrome price schedule. Add 2c. for each additional 0.25% N. High-carbon type: 66-71% Cr, 4-5% C, 0.75% N. Add 5c. per lb. to regular high-carbon ferrochrome price schedule.

Low-Carbon Ferromanganese

Contract prices per lb. of manganese contained, lump size, f.o.b. shipping point, freight allowed to destination, Eastern Zone. Add 0.25c. for spot sales.

	Carloads, Ton Bulk	Lots	Less Ton
0.10% max. C, 1 or 2% max. Si..	23.00c.	23.40c.	23.65c.
0.15% max. C, 1 or 2% max. Si..	22.00c.	22.40c.	22.65c.
0.30% max. C, 1 or 2% max. Si..	21.00c.	21.40c.	21.65c.
0.50% max. C, 1 or 2% max. Si..	20.00c.	20.40c.	20.65c.
0.75% max. C, 7.00% max. Si..	16.00c.	16.40c.	16.65c.

Ferrochrome Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 60 per cent contained chromium. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk..	8.25c.	8.55c.	8.95c.
Ton lots	8.75c.	9.25c.	10.75c.
Less ton lots..	9.00c.	9.50c.	11.00c.

Ferromanganese Briquets

Contract prices per lb. of briquet, f.o.b. shipping point, freight allowed to destination. Approx. 66 per cent contained manganese. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk..	6.05c.	6.30c.	6.60c.
Ton lots	6.65c.	7.55c.	8.55c.
Less ton lots..	6.80c.	7.80c.	8.80c.

Calcium—Manganese—Silicon

Contract prices per lb. of alloy, lump size, f.o.b. shipping point, freight allowed to destination.

16-20% Ca, 14-18% Mn, 53-59% Si. Add 0.25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carloads	15.50c.	16.00c.	18.05c.
Ton lots	16.50c.	17.35c.	19.10c.
Less ton lots.	17.00c.	17.35c.	19.60c.

Calcium Metal

Eastern zone contract prices per lb. of metal, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. Add 0.9c. for Central Zone; 0.49c. for Western Zone.

	Cast	Turnings	Distilled
Ton lots	$1.80	$2.30	$5.00
Less ton lots..	2.30	2.80	5.75

Chromium—Copper

Contract price per lb. of alloy, f.o.b. Niagara Falls, freight allowed east of the Mississippi River. 8-11% Cr, 88-90% Cu, 1.00% max. Fe, 0.50% max. Si. Add 2c. for spot sales.

Shot or ingot ..... 45c.

Ferroboron

Contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination. Add 5c. for spot sales. 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.20	$1.2075	$1.229
Less ton lots..	1.30	1.3075	1.329

Manganese—Boron

Contract prices per lb. of alloy, f.o.b. shipping point, freight charges allowed. Add 5c. for spot sales.

75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C.

	Eastern Zone	Central Zone	Western Zone
Ton lots	$1.89	$1.903	$1.935
Less ton lots..	2.01	2.023	2.055

Nickel—Boron

Spot and contract prices per lb. of alloy, f.o.b. shipping point, freight allowed to destination.

15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni.

	Eastern Zone	Central Zone	Western Zone
11,200 lb. or more	$1.90	$1.9125	$1.9445
Ton lots	2.00	2.09125	2.0445
Less ton lots..	2.10	2.1125	2.1445

Other Ferroalloys

Ferrotungsten, Standard grade lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa. York, Pa., per lb. contained tungsten, 10,000 lb. or more.... $1.90

Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.

Open hearth	$2.70
Crucible	$2.80
Primos	$2.90

Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal..... $1.50

Vanadium pentoxide, 88-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5..... $1.10

Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)

Carload lots	25c.
2000 lb. to carload.....	26c.

Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)

Carload lots	58c.
2000 lb. to carload.....	59c.

Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis

No. 1	87.5c.
No. 6	60c.
No. 79	45c.

Bortram, f.o.b. Niagara Falls

Ton lots, per lb.....	45c.
Less ton lots, per lb.....	50c.

Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.

2000 lb. lots	$2.25
Under 2000 lb. lots.....	$2.30

Ferrotitanium, 40-45%, 0.10%C. max. f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained Ti.. $1.23
Less ton lots..... $1.25

Ferrotitanium, 20-25%, 0.10%C. max., ton lots, per lb. contained titanium $1.35
Less ton lots..... $1.40

High-carbon ferrotitanium, 15%-20%, 6-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y. freight allowed East of Mississippi River, north of Baltimore and St. Louis, per carload..... $142.50

Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton..... 58.50

Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton $75.00

Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo. 95c.

Calcium molybdate, 40-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo. ..... 80c.

Molybdenum oxide briquets, 48-52% Mo. f.ob. Langeloth, Pa. per lb. contained Mo..... 80c.

Molybdenum oxide, in cans, f.o.b Langeloth and Washington, Pa. per lb. contained Mo..... 80c.

Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales

Carload lots	14c.

Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy

Carload, bulk	4.6c

Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk ..... 5.75c.
Ton lots ..... 7.25c.

Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.

Car lots	8.00c
Ton lots	8.75c.
Less ton lots	9.25c.

$1.90

$2.70
$2.80
$2.90

$1.50

$1.10

25c.
26c.

58c.
59c.

87.5c.
60c.
45c.

45c.
50c.

$2.25
$2.30

$1.23
$1.25

$1.35
$1.40

$142.50

58.50

$75.00

95c.

80c.

80c.

80c.

14c.

4.6c

5.75c.
7.25c.

8.00c
8.75c.
9.25c.